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BBA BRITISH BOARD OF AGRÉMENT
TECHNICAL APPROVALS FOR CONSTRUCTION

Agrément Certificate
98/3459
Product Sheet 1

PROTAN SE, SEX AND SEXG MECHANICALLY FASTENED PVC ROOFING MEMBRANES

PRODUCT SCOPE AND SUMMARY OF CERTIFICATE

This Certificate of Confirmation relates to Protan SE, SEX and SEXG, a range of mechanically fastened polyester reinforced PVC roof waterproofing membranes.

AGRÉMENT 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 membranes and joints in the membranes, when completely sealed and consolidated, will resist the passage of moisture to the interior of the building (see section 5).

Properties in relation to fire — tests indicate that the membranes will enable a roof to be unrestricted under the Building Regulations (see section 6).

Resistance to wind uplift — when correctly specified, the membranes will resist the effects of any likely wind suction acting on the roof (see section 7).

Resistance to foot traffic — the membranes will accept the limited foot traffic and loads associated with the installation and maintenance of the membranes without damage (see section 8).

Durability — under normal service conditions, the membranes should provide a durable waterproof covering with a service life of at least 30 years (see section 10).

The BBA has awarded this Agrément Certificate to the company named above for the products described herein. These products have been assessed by the BBA as being fit for their intended use provided they are installed, used and maintained as set out in this Certificate.

On behalf of the British Board of Agrément

Date of First issue: 26 August 2008
Originally certificated on 3 March 1998

Simon Wroe
Head of Approvals — Materials

Greg Cooper
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

Readers are advised to check the validity and latest issue number of this Agrément Certificate by either referring to the BBA website or contacting the BBA direct.

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Regulations

In the opinion of the BBA, Protan SE, SEX and SEXG Mechanically Fastened PVC Roofing Membranes, if used in accordance with the provisions of this Certificate, will meet or contribute to meeting the relevant requirements of the following Building Regulations:

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

Requirement:	B4(2)	External fire spread
Comment:		Test data to BS 476-3 : 1958 indicate that on suitable substructures the use of the membranes will enable a roof to be unrestricted under this Requirement. See sections 6.1 to 6.3 of this Certificate.
Requirement:	C2(b)	Resistance to moisture
Comment:		Tests for water resistance on the membranes, including joints, indicate that the membranes meet this Requirement. See section 5.1 of this Certificate.
Requirement:	Regulation 7	Materials and workmanship
Comment:		The membranes are acceptable. See section 10 and the *Installation* part of this Certificate.

The Building (Scotland) Regulations 2004 (as amended)

Regulation:	8(1)(2)	Fitness and durability of materials and workmanship
Comment:		The use of the membranes satisfy the requirements of this Regulation. See sections 9 and 10 and the *Installation* part of this Certificate.
Regulation:	9	Building standards — construction
Standard:	2.8	Spread from neighbouring buildings
Comment:		Test data to BS 476-3 : 1958 indicate that the membranes when applied to a non-combustible substrate, can be regarded as having low vulnerability under clause 2.8.1[(1)(2)] of this Standard. See sections 6.1 to 6.3 of this Certificate.
Standard:	3.10	Precipitation
Comment:		Tests for water resistance of the membranes indicate that the use of the membranes will enable a roof to satisfy the requirements of this Standard, with reference to clauses 3.10.1[(1)(2)] and 3.10.7[(1)(2)]. See section 5.1 of this Certificate.
Regulation:	12	Building standards — conversions
Comment:		All comments given for the membranes under Regulation 9 also apply to this Regulation, with reference to clause 0.12[(1)(2)] and Schedule 6[(1)(2)].
		(1) Technical Handbook (Domestic).
		(2) Technical Handbook (Non-Domestic).

The Building Regulations (Northern Ireland) 2000 (as amended)

Regulation:	B2	Fitness of materials and workmanship
Comment:		The membranes are acceptable. See section 10 and the *Installation* part of this Certificate.
Regulation:	B3(2)	Suitability of certain materials
Comment:		The membranes are acceptable. See section 9 of this Certificate.
Regulation:	C4(b)	Resistance to ground moisture and weather
Comment:		Tests for water resistance of the membranes, including joints, indicate that the use of the membranes will enable a roof to satisfy the requirements of this Regulation. See section 5.1 of this Certificate.
Regulation:	E5(b)	External fire spread
Comment:		Test data to BS 476-3 : 1958 indicate that on suitable substructures, the use of the membranes will enable a roof to be unrestricted under the requirements of this Regulation. See sections 6.1 to 6.3 of this Certificate.

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

Information in this Certificate may assist the client, CDM co-ordinator, designer and contractors to address their obligations under these Regulations.

See section: 1 *Description* (1.4).

Non-regulatory Information

NHBC Standards 2007

NHBC accepts the use of Protan SE, SEX and SEXG Mechanically Fastened PVC Roofing Membranes, when installed in accordance with this Certificate, as meeting Technical Requirements R3 in relation to *NHBC Standards*, Chapter 7.1, *Flat roofs and balconies*.

In the opinion of the BBA, Protan SE, SEX and SEXG Mechanically Fastened PVC Roofing Membranes, when installed and used in accordance with this Certificate, satisfy the requirements of the *Zurich Building Guarantee Technical Manual*, Section 4, *Superstructure*, Sub-section *Flat roofs*.

General

This Certificate of Confirmation relates to Protan SE, SEX and SEXG, woven polyester reinforced PVC roof waterproofing membranes, for use as a mechanically-fastened waterproof covering on pitched or flat roofs with limited access.

The membranes are manufactured in Norway by Protan A/S and marketed in the UK by the Certificate holder.

Confirmation of Norwegian Technical Approval 2010/95 issued by the SINTEF Building and Infrastructure to Protan A/S.

Technical Specification

1 Description

1.1 Protan SE, SEX and SEXG Mechanically Fastened PVC Roofing Membranes consist of a woven polyester reinforced PVC roofing sheet, with a slip-resistant upper surface and using hot-air welded lap joints and mechanically fixed using fasteners approved by the Certificate holder. The membranes covered by this Certificate include:

- Protan SE – standard membrane requiring a separation/protection layer when used over polystyrene insulation boards or re-roofing applications
- Protan SEX — laminated with a polyester felt on the underside to enable installation directly over existing systems
- Protan SEXG — laminated with a glass felt on the underside to enable installation directly over polystyrene insulation boards.

1.2 The Protan SE membranes are also produced in a standard 2 m width with factory-welded fixing strips on the underside, and are marketed as the Protan Secret-Fix System.

1.3 The membranes are manufactured by coating the polyester fabric base on both sides with a plastisol coating fused into one homogeneous sheet. The coating can be applied in several layers to achieve the required membrane thickness and is then passed through a gelation oven.

1.4 The membranes are manufactured with the nominal characteristics shown in Table 1.

Table 1 Nominal characteristics

Characteristic (units)	Membrane						
	Protan SE			Protan SEX		Protan SEXG	
Thickness (mm)	1.2	1.6	1.8	1.2	1.6	1.2	1.6
Roll length (m)	20	20	15	20	20	20	20
Roll width (m)	1, 2	1, 2	1, 2	1, 2	1, 2	1, 2	1, 2
Weight per unit area (kgm^{-2})	1.4	1.8	2.0	1.4	1.8	1.4	1.8
Weight of polyester reinforcement (gm^{-2})	80	80	80	80	80	80	80
Weight of polyester backing fleece (gm^{-2})	–	–	–	180	180	–	–
Weight of glass backing fleece (gm^{-2})	–	–	–	–	–	50	50

– Not applicable.

1.5 The membrane is manufactured in standard colours(1) of:

under side — dark grey or black,

upper side — light grey, dark grey, red, black and copper green.

(1) Other colours are available to special order and are subject to minimum quantities.

1.6 Ancillary materials used with the membranes include:

- Telescopic tube, flat metal washers, non-thermal bridging plate, and various fastener types to suit the relevant decks
- PVC fixing pocket — a factory-produced pocket for securing the membrane at upstands
- Protan Fixing Bar — a roll-formed 1.5 mm bar for use in conjunction with fixing pocket
- Protan PVC laminated metal — a 0.6 mm thick, galvanized steel sheet, factory laminated with 1.2 mm thick Protan G membrane
- Preformed internal and external corners

- Pipe cloaks — preformed cloaks for use at penetrations
- Rainwater outlets — stainless steel outlets with a Protan membrane flange
- Protan Omega Profile — for use to create architectural features on pitched roofs
- Protan 2.4 mm GT Terrace Grade — a 2.4 mm thick, PVC membrane for use on access walkways and lightly-trafficked terraces
- Protan Progrip Walkway
- Protan Pavepad — bearing pads for concrete slabs
- Polypropylene geotextiles — a range of 140 gm^{-2} to 800 gm^{-2} non-woven mats, for use as protection layers over existing bitumen roofing or uneven substrates
- Protan Constant Force Post — used as a part of a Mansafe System
- Protan Lightning Clips — protection cable anchor clips
- Protan Vapour Control Layers.

1.7 Quality control checks are carried out during production and on the finished products.

2 Delivery and site handling

2.1 The membranes are delivered to site in rolls. Pallets are covered with polyethylene wrappings bearing the product name, batch number and the BBA identification mark incorporating the number of this Certificate.

2.2 Each roll has a product identification code on the inside of the cardboard reel. A production date and recycling symbol to identify the product classification are embossed into the membrane.

2.3 Rolls should be stored on a clean, level, dry surface and kept under cover.

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on Protan SE, SEX and SEXG Mechanically Fastened PVC Roofing Membranes.

Design Considerations

3 General

3.1 Protan SE, SEX and SEXG Mechanically Fastened PVC Roofing Membranes are satisfactory for use as a mechanically-fixed roof waterproofing layer on pitched or flat roofs with limited access.

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

3.3 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. 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.

3.4 Decks to which this system is to be applied must comply with the relevant requirements of BS 8217 : 2005 and BS 6229 : 2003, and, where appropriate, *NHBC Standards*, Chapter 7.1 or the *Zurich Building Guarantee Technical Manual* 2007, Section 4, *Superstructure*, Sub-section *Flat roofs*, pages 268–270.

3.5 Insulation materials used in conjunction with the membranes must be approved by the Certificate holder and be either:

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

3.6 Contact with certain bituminous, coal tar and oil-based products must be avoided as the membrane is not compatible with lower grades of bitumen. If contact with such products is likely, a separating layer should be interposed before installing the waterproof sheet. Direct contact between the membrane and polystyrene insulation boards should also be avoided. Where doubt arises, the advice of the Certificate holder should be sought.

4 Practicability of installation

The membranes should only be installed by trained installers. Details of these are available from the Certificate holder.

5 Weathertightness

5.1 Data confirm that the membranes, including joints, 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 thus:

England and Wales — Approved Document C, Requirement C2(b), Section 6

Scotland — Mandatory Standard 3.10, clauses 3.10.1[1][2] and 3.10.7[1][2]

(1) Technical Handbook (Domestic).

(2) Technical Handbook (Non-Domestic).

Northern Ireland — Regulation C4(b).

5.2 The membranes are impervious to water and when used as described in this Certificate, will give a weathertight roof covering capable of accepting minor structural movement without damage.

6 Properties in relation to fire

6.1 When tested in accordance with BS 476-3 : 1958, a system comprising 0.7 mm profiled steel decking, 50 mm polyurethane insulation with an aluminium foil facing on the upperside and glass tissue facing to the underside and one layer of Protan SE mechanically fixed, achieved an EXT.F.AA rating.

6.2 When tested in accordance with BS 476-3 : 2004, a system comprising 0.7 mm profiled steel decking, 0.21 mm thick vapour control layer, 90 mm foil-faced polyurethane insulation and one layer of Protan SE mechanically fixed, achieved an EXT.S.AB rating.

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

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

Scotland — Test to conform to Mandatory Standard 2.8, clause 2.8.1[1][2]

(1) Technical Handbook (Domestic).

(2) Technical Handbook (Non-Domestic).

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

7 Resistance to wind uplift

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

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

7.2 The number of fixings used should be established by reference to the wind uplift forces calculated in accordance with BS 6399-2 : 1997 on the basis of the maximum permissible loads.

8 Resistance to foot traffic

8.1 Data indicate that the membranes can withstand, without damage, the limited foot traffic and light concentrated loads associated with the installation and maintenance operations. However, reasonable care should be taken to avoid puncture by sharp objects or concentrated loads. Where regular traffic is envisaged, ie maintenance of lift equipment, a walkway must be provided using the appropriate Protan ancillary materials given in section 1.6.

8.2 The membrane has a textured finish to aid slip resistance for foot traffic. However, care should be taken when walking across the roof if surface water is present.

9 Maintenance

Roofs covered with the products should be the subject of annual inspections, as is good practice with all waterproofing systems, to ensure continued security and performance.

10 Durability

Accelerated weathering tests and performance in service confirm that satisfactory retention of physical properties is achieved. All available evidence suggests that Protan Mechanically Fastened PVC Roofing Membranes should have a life in excess of 30 years.

Installation

11 General

11.1 Installation of Protan SE, SEX and SEXG Mechanically Fastened PVC Roofing Membranes must be in strict accordance with the manufacturer's fixing instructions and should be carried out only by Protan Partner Contractors using trained labour, records for whom are kept on the Certificate holder's database.

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

11.3 Insulation boards should be fixed to the substructure in such a way as not to impair the performance of the waterproofing membrane.

11.4 Deck surfaces should be clean, dry, and free from sharp projections, such as nail heads or concrete nibs. When necessary, a separating or levelling layer may be interposed between the substrate and the membrane.

11.5 The membrane should not be laid in damp weather nor when the temperature falls below –10°C, and below 5°C precautions should be taken against the formation of condensation.

12 Procedures

12.1 The membrane should be laid flat onto the substrate without folds or ripples, and fixed to the deck using Protan telescopic tubes or washers fixed by screws through the membrane, or factory-welded fixing strips (see Figures 1 and 2).

Figure 1 Standard overlap design

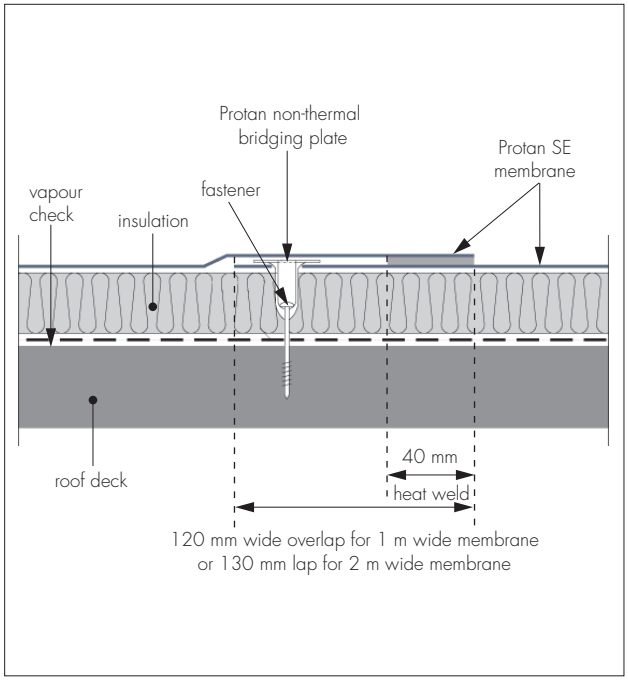
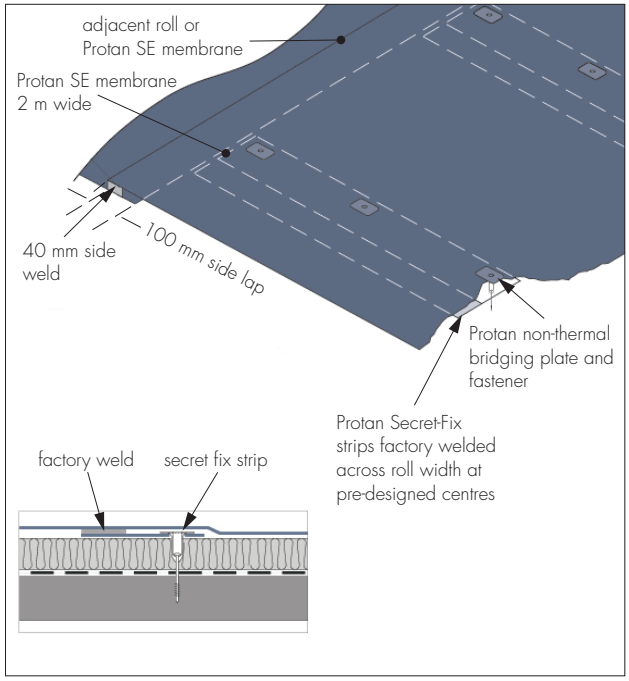


Figure 2 Secret-Fix System



12.2 The position and the number of fasteners required must be in accordance with the fixing specifications provided by the Certificate holder.

12.3 At upstands, or change in angle, the horizontal membrane is secured using a preformed PVC pocket, heat welded to the underside of the membrane, and Protan metal bars. The bars are sleeved within the pocket and mechanically fastened to the upstand.

12.4 On main roof areas where a steel decking is used, the membrane should be installed at 90° to the profile. Alternatively, when the Secret-Fix System is used, the membrane should be installed in the same direction as the profile.

13 Lap welding procedures

13.1 To ensure a watertight seam, the membrane should be lapped by a minimum of 120 mm for 1 m width sheets or a minimum of 130 mm for 2 m width sheets at side laps and 80 mm at end laps. Hot-air welding is by hand or machine using equipment approved by the Certificate holder.

13.2 When welding using a machine, test welds should be carried out to ensure the optimum setting for temperature, speed and pressure prior to the start of work.

13.3 When hand welding, a continuous pre-weld should be made at the back edge of the overlap prior to full welding. The weld is then completed giving a finished seam width of 40 mm.

13.4 In all cases, an uninterrupted extrusion of molten material should be visible along the seam.

13.5 On completion of the weld, the seam should be tested for total consolidation using a seam probe.

14 Details

The Certificate holder supplies a range of components for the treatment of details such as flashings, penetrations (for example, see Figures 3 to 6.)

Figure 3 Secret-Fix pocket and parapet wall flashing detail

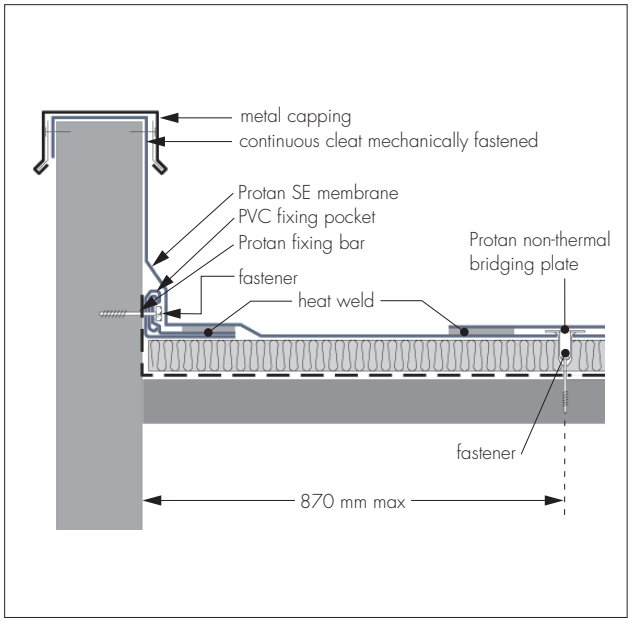


Figure 4 Roof edge trim

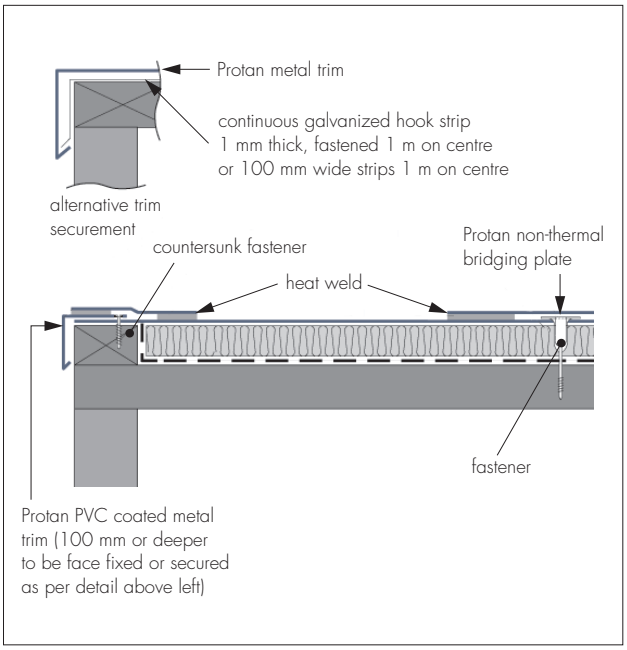


Figure 5 Drainage — Protan Rainwater Outlet

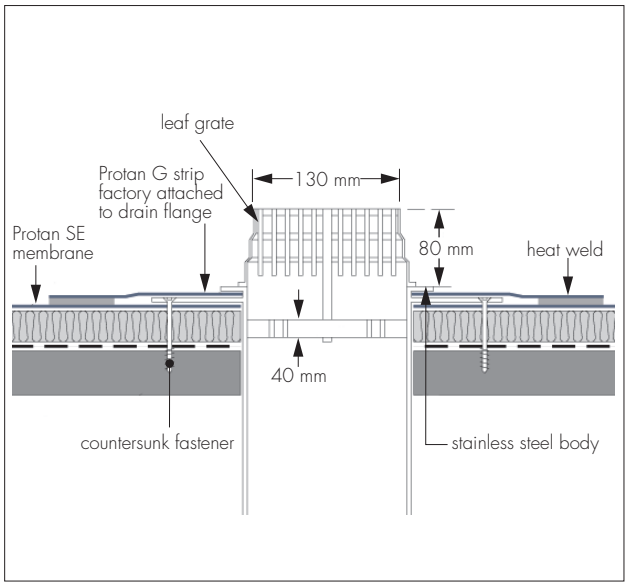
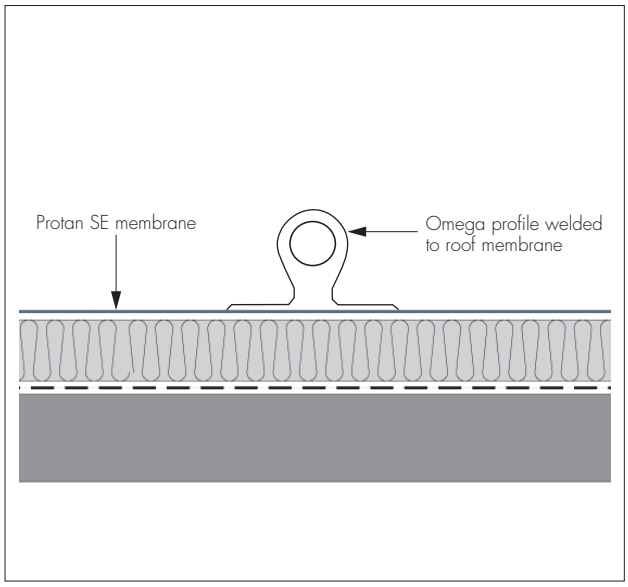


Figure 6 Omega Architectural Profile



15 Repair

In the event of accidental damage, repair should be carried out in accordance with the Certificate holder's instructions. Repair consists of applying a welding patch of Protan SE membrane extending at least 50 mm beyond the defect. The joint should be cleaned back to unweathered material and hot-air welded.

16 Tests

Technical data from tests carried out by NBI leading to the issue of NBI Technical Approval 2010/95 and additional tests carried out by the BBA, were evaluated in the context of UK roofing practice and Building Regulations. The results are summarised in Tables 2 and 3.

Table 2 Physical properties — directional

Test (units)	Mean result		Method[1]
	Long[2]	Trans[3]	
Tensile strength (N per 50 mm)			DIN 53354
unaged	948	832	
heat aged[4]	1100	1073	
water soak[5]	983	1006	
naturally aged[6]	1110	1066	
Elongation at break (%)			DIN 53354
unaged	19	22	
heat aged[4]	21	24	
water soak[5]	20	23	
naturally aged[6]	17	22	
Tear strength (N)	203	210	DIN 53363
Dimensional stability (%)			DIN 53377
unaged	–0.2	–0.1	
heat aged[4]	–0.6	–0.1	
water soak[5]	–0.6	+0.2	
naturally aged[6]	–0.9	–1.7	

(1) The test documents are detailed in the *Bibliography*.
(2) Longitudinal direction.
(3) Transverse direction.
(4) Heat aged 28 days at 80°C.
(5) Water soak 7 days at 60°C.
(6) Naturally aged for 96 weeks.

Table 3 Service performance

Test (units)	Result	Method[1]
Water vapour permeability ($gm^{-2}day^{-1}$)	3.15	BS 3177
Water vapour resistance ($MNsg^{-1}$)	65	BS 3177
Low temperature flexibility (°C)		DIN 53361
unaged	–30	
heat aged[2]	–30	
water soak[3]	–30	
naturally aged[4]	–25	
Static indentation		MOAT 27 5.1.9
substrate		
concrete	L_4	
EPS	L_4	
Dynamic indentation		MOAT 27 : 5.1.10
substrate		
perlite	I_3	
EPS	I_3	
Leakage at joints	pass	MOAT 27 : 5.2.1
Tensile strength of joints (N)		MOAT 27 : 5.2.2/3/4
unaged	891	
heat aged[2]	874	
water soak[3]	890	
T-peel (Nmm^{-1})	5.11	MOAT 29 : 4.17.2
Coefficient of friction		BBA T1/10
dry	0.64	
wet	0.15	

(1) Test documents are detailed in the *Bibliography*. Numbers in the table refer to sections/parts of the various documents.
(2) Heat aged 28 days at 80°C.
(3) Water soak 7 days at 60°C.
(4) Naturally aged for 96 weeks.

17 Investigations

17.1 Existing data on the fire performance of the membrane were examined.

17.2 The manufacturing process was examined, including the methods adopted for quality control.

17.3 A visit was made to a site in progress to assess the methods of application.

17.4 Norwegian wind uplift test data were assessed to ascertain the suitability of the fastening system.

17.5 Test data on samples taken by NBI during 2003 from an exposed site installed during 1977/78 were assessed against the product as new.

Bibliography

BS 476-3 : 1958 *Fire tests on building materials and structures — External fire exposure roof test*
BS 476-3 : 2004 *Fire tests on building materials and structures — Classification and method of test for external fire exposure to roofs*

BS 3177 : 1959 *Method for determining the permeability to water vapour of flexible sheet materials used for packaging*

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

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

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

DIN 53354 : 1981 *Testing of artificial leather; Tensile test*

DIN 53361 : 1982 *Testing of artificial leather and similar sheet materials; Determination of suppression at groove in coolness*

DIN 53363 : 1969 *Testing of Plastic Films; Tear propagation Test on Trapezoidal Specimens with a Slit*

DIN 53377 : 1969 *Testing of plastic films; Determination of dimensional stability*

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

MOAT No 29 : 1984 *Directives for the Assessment of Roofing Systems using PVC sheets without reinforcement, loose laid under heavy protection and not compatible with bitumen*

18 Conditions

18.1 This Certificate:

- relates only to the product/system that is named and described on the front page
- is granted only to the company, firm or person named on the front page — no other company, firm or person may hold or claim any entitlement to this Certificate
- is valid only within the UK
- has to be read, considered and used as a whole document — it may be misleading and will be incomplete to be selective
- is copyright of the BBA
- is subject to English law.

18.2 References in this Certificate to any Act of Parliament, Statutory Instrument, Directive or Regulation of the European Union, British, European or International Standard, Code of Practice, manufacturers' instructions or similar publication, are references to such publication in the form in which it was current at the date of this Certificate.

18.3 This Certificate will remain valid for an unlimited period provided that the product/system and the manufacture and/or fabrication including all related and relevant processes thereof:

- are maintained at or above the levels which have been assessed and found to be satisfactory by the BBA
- remain covered by a valid Norwegian Agrément; and
- are reviewed by the BBA as and when it considers appropriate.

18.4 In granting this Certificate, the BBA is not responsible for:

- 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
- individual installations of the product/system, including the nature, design, methods and workmanship of or related to the installation
- the actual works in which the product/system is installed, used and maintained, including the nature, design, methods and workmanship of such works.

18.5 Any information relating to the manufacture, supply, installation, use and maintenance 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 and maintained. It does 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; 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. 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 manufacture, supply, installation, use and maintenance of this product/system.

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