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**Agrément
Certificate
No 98/3459**
Third issue *

Designated by Government
to issue
European Technical
Approvals

PROTAN MECHANICALLY FASTENED PVC ROOFING MEMBRANES

Revêtement d'étanchéité
Dachabdichtungen

Product



• THIS CERTIFICATE OF CONFIRMATION RELATES TO PROTAN MECHANICALLY FASTENED PVC ROOFING MEMBRANES, WOVEN POLYESTER REINFORCED PVC ROOF WATERPROOFING MEMBRANES.

• The membranes are for use as a mechanically-fastened waterproof covering on pitched or flat roofs with limited access.

• Installation must be carried out only by trained and approved installers.

• The membrane is marketed in the United Kingdom by Protan (UK) Limited, and manufactured by Protan A/S, Postboks 420, N-3002, Drammen, Norway.
Tel: 00 47 32 221600
Fax: 00 47 32 1700.

continued

Regulations

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, Protan Mechanically Fastened PVC Roofing Membranes, 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 from tests 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 11.1 and 11.2 of this Certificate.

Requirement: C4

Resistance to weather and ground moisture

Comment:

Tests for water resistance on the membranes, including joints, indicate that the system meets this Requirement. See section 8.1 of this Certificate.

Requirement: Regulation 7

Materials and workmanship

Comment:

The membranes are acceptable materials. See section 13 of this Certificate.

Confirmation of Norwegian
 Agrément issued by the Norges
 byggeforskningsinstitutt (NBI) to
 Protan A/S, Bok 420,
 N-3002 Drammen, Norway.

Electronic Copy

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



In the opinion of the BBA, Protan Mechanically Fastened PVC Roofing Membranes, 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
Standard:	B2.1	Selection and use of materials, fittings, and components, and workmanship
Comment:		The product can contribute to a construction meeting this Standard. See the <i>Installation</i> part of this Certificate.
Standard:	B2.2	Selection and use of materials, fittings, and components, and workmanship
Comment:		The membranes comply with this Standard. See section 13 of this Certificate.
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 use of the membranes will enable a roof to be unrestricted under this Standard. See sections 11.1 and 11.2 of this Certificate.
Regulation:	17	Resistance to moisture
Standard:	G3.1	Resistance to precipitation — Resistance to precipitation
Comment:		Tests for water resistance indicate that use of the membranes can enable a roof to satisfy the requirements of this Standard. See section 8.1 of this Certificate.

3 The Building Regulations (Northern Ireland) 2000



In the opinion of the BBA, Protan Mechanically Fastened PVC Roofing Membranes, 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 membranes are acceptable materials. See section 13 of this Certificate.
Regulation:	C4	Resistance to ground moisture and weather
Comment:		Tests for water resistance of the system, including joints, indicate that the use of the membranes can enable a roof to satisfy the requirements of this Regulation. See section 8.1 of this Certificate.
Regulation:	E5	External fire spread
Comment:		Data obtained from tests 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 11.1 and 11.2 of this Certificate.

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 sections: 5 *Description* (5.4) and 10 *Resistance to foot traffic* (10.2).

Technical Specification

5 Description

5.1 Protan Mechanically Fastened PVC Roofing Membranes consist of a woven polyester reinforced PVC roofing sheet, a slip-resistant upper surface with hot-air welded lap joints, mechanically fixed using fastener-attached, recessed tubes or flat washers. Three membrane types are covered by the Certificate:

- 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.

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

5.3 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.

5.4 The membranes are manufactured to the nominal parameters given in Table 1.

Table 1 Nominal parameters

Parameter (units)	Membrane							
	Protan SE			Protan SEXG		Protan SEX		
Thickness (mm)	1.2	1.6	1.8	1.2	1.6	1.2	1.6	
Roll length (m)	20	20	20	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.

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

underside — dark grey or black,
upperside — light grey, dark grey, red, blue and green.

(1) Other colours are available to special order.

5.6 Ancillary materials used with the system 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 1.4 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, Batten and Triangle Profiles — 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 Proclip Decking — for use with walkways and terraces
- 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 Mansate System

- Protan Lightning Clips — protection cable anchor clips
- Protan Vapour Control Layers
- Protan Rooflights with membrane lined kerbs.

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

6 Delivery and site handling

6.1 The membrane is 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.

6.2 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.

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

Design Data

7 General

7.1 Protan Mechanically Fastened PVC Roofing Membranes are satisfactory for use as a mechanically-fixed roof waterproofing layer on pitched or flat roofs with limited access.

7.2 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.

7.3 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.

7.4 Decks to which this system is to be applied must comply with the relevant requirements of BS 8217 : 1994 and BS 6229 : 2003, and, where appropriate, NHBC Standards, Chapter 7.1 or Zurich Building Guarantees Technical Standards, page 234.

7.5 Insulation materials used in conjunction with the system must be one of the following:

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

7.6 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 marketing company should be sought.

7.7 Installation must only be carried out by installers trained and approved by the marketing company.

8 Weathertightness



8.1 Test data confirm that the membrane, and joints in the membrane, 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

Regulation 17, Standard G3.1

Northern Ireland

Regulation C4.

8.2 The system is impervious to water and, when used as described, will give a weathertight roof covering capable of accepting minor structural movements without damage.

9 Resistance to wind uplift

9.1 The resistance to wind uplift of the mechanically fastened waterproofing layer is provided by the Protan washers secured to the deck by screws passing through the membrane. The number and position of fixings and washers will depend on many factors, including:

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

9.2 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.

10 Resistance to foot traffic

10.1 Test data indicate that the system can accept, without damage, the limited foot traffic and light concentrated loads associated with installation and maintenance operations. However, reasonable care should be taken to avoid puncture by sharp objects or concentrated loads. Anywhere regular traffic is envisaged, ie such as the maintenance of lift equipment, a walkway must be provided using

the appropriate Protan ancillary materials given in section 5.6.

10.2 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.

11 Properties in relation to fire



11.1 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.

11.2 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

test to conform with Standard D9.1

Northern Ireland

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

12 Maintenance

In the event of damage, repair should be carried out to the marketing company's instructions. Repair consists of applying a welding patch of Protan SE. The joint should be cleaned back to unweathered material and hot-air welded.

13 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

14 General

14.1 Installation of Protan 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 of whom are kept on the Certificate holder's database.

14.2 In all cases a vapour retarder should be used directly over the deck. When internal temperatures and humidity conditions will exceed 22°C and 50% relative humidity, special

precautions should be taken and the marketing company should be consulted.

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

14.4 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.

14.5 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.

15 Procedures

15.1 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

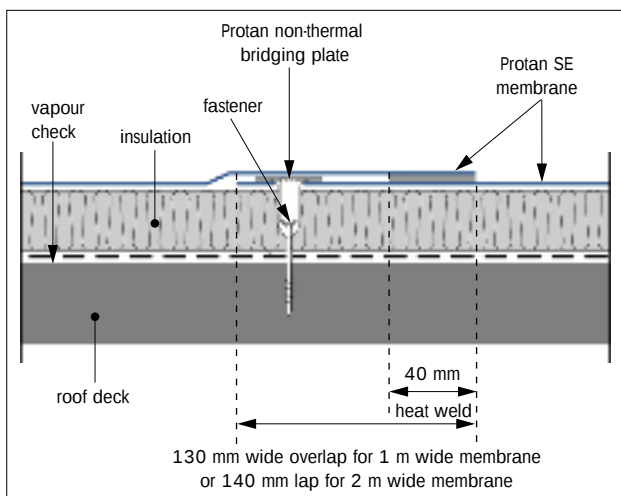
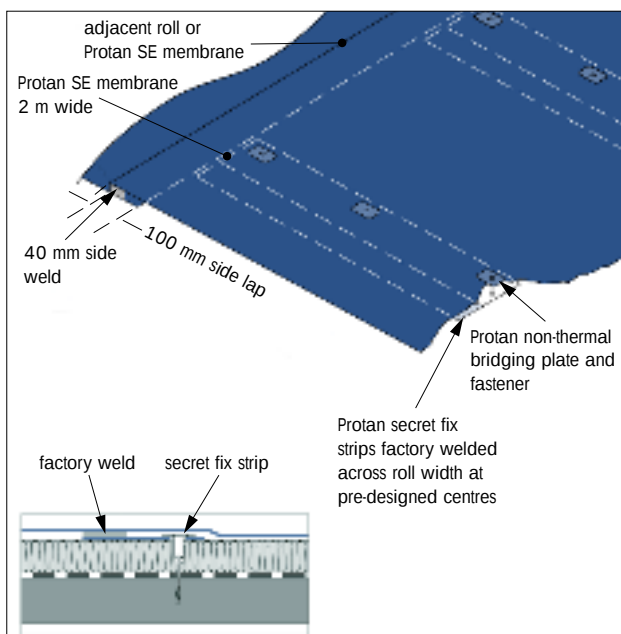


Figure 2 Secret-Fix System



15.2 The position and the number of fasteners required must be in accordance with the fixing specifications provided by the manufacturer.

15.3 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.

15.4 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.

16 Lap welding procedures

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

16.2 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.

16.3 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 between 10 mm and 40 mm.

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

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

17 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

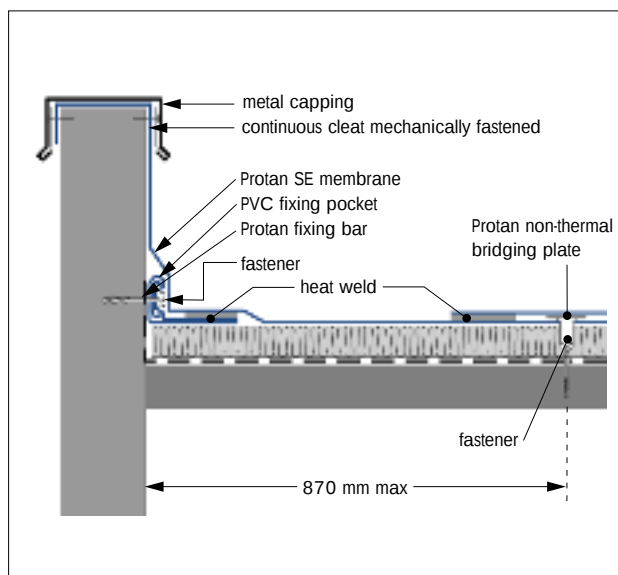


Figure 4 Roof edge trim

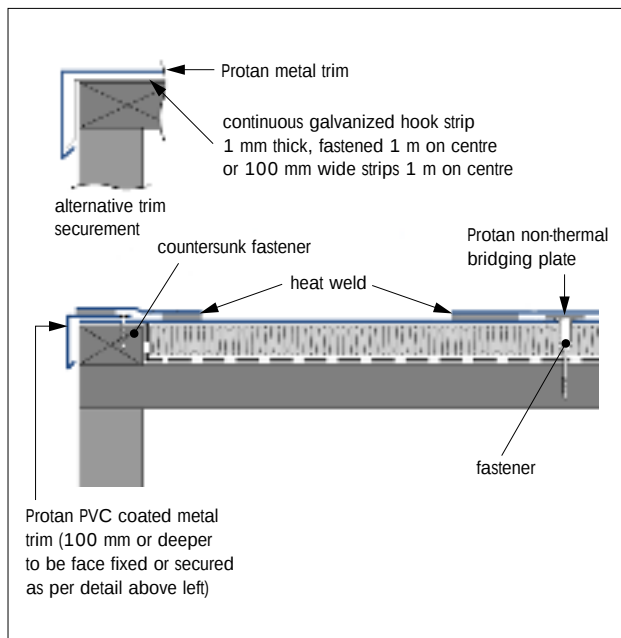


Figure 5 Drainage — Protan Rainwater Outlet

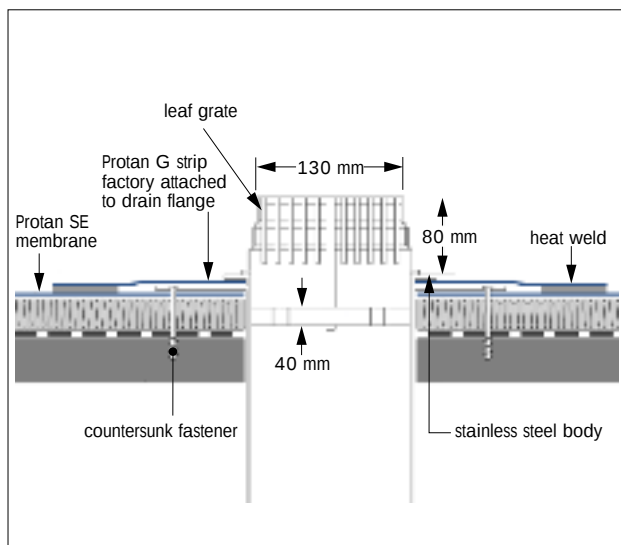
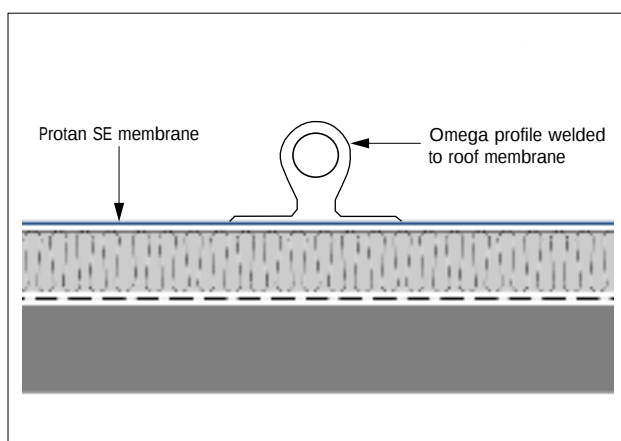


Figure 6 Omega Architectural Profile



Technical Investigations

The following is a summary of the technical investigations carried out on Protan Mechanically Fastened PVC Roofing Membranes.

18 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.

19 Investigations

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

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

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

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

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

Table 2 Physical properties — directional

Test (units)	Method ⁽¹⁾	Mean results	
		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)	DIN 53363	203	210
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)	Method ⁽¹⁾	Result
Water vapour permeability ($\text{gm}^{-2}\text{day}^{-1}$)	BS 3177	3.15
Water vapour resistance (MNsg^{-1})	BS 3177	65
Low temperature flexibility ($^{\circ}\text{C}$)	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	MOAT 27 : 5.2.1	pass
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})	MOAT 29 : 4.17.2	5.11
Coefficient of friction	BBA T1 / 10	
dry		0.64
wet		0.15

(1) Test document is 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.

Bibliography

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

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

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*

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

DIN 53361 : 1982 *Testing synthetic leather and similar surface structures; Determining the flexing behaviour under cold conditions*

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*

Conditions of Certification

20 Conditions

20.1 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) is valid only within the UK;
- (d) has to be read, considered and used as a whole document — it may be misleading and will be incomplete to be selective;
- (e) is copyright of the BBA;
- (f) is subject to English law.

20.2 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, are references to such publication in the form in which it was current at the date of this Certificate.

20.3 This Certificate will remain valid for an unlimited period provided that the product and the manufacture and / or fabrication including all related and relevant processes 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 Norwegian Agrément; and

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

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

- (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 or standard of individual installations of the product or any maintenance thereto, including methods and workmanship.

20.5 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, Protan Mechanically Fastened PVC Roofing Membranes are fit for their intended use provided they are installed, used and maintained as set out in this Certificate. Certificate No 98/3459 is accordingly awarded to Protan (UK) Limited.

On behalf of the British Board of Agrément

Date of Third issue: 3rd February 2004

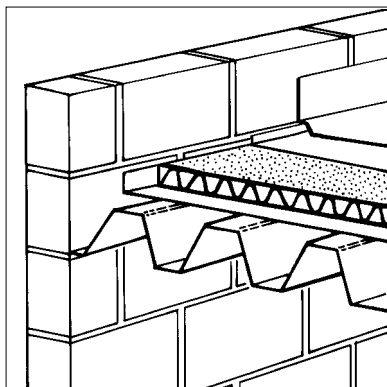
Chief Executive

**Original Certificate issued on 3rd March 1998 and Second issue on 4th June 2003 (not printed). This amended version includes revised Durability statement and new Conditions of Certification.*



**PROTAN MECHANICALLY FASTENED PVC ROOF MEMBRANES
(BBA CERTIFICATE No 98/3459)**

IRISH BUILDING REGULATIONS STATEMENT



- *THIS STATEMENT RELATES TO PROTAN MECHANICALLY FASTENED PVC ROOF MEMBRANES AND SETS OUT THE OPINION OF THE BBA ON THE POSITION OF THE PRODUCT UNDER THE BUILDING REGULATIONS IN THE REPUBLIC OF IRELAND.*
- *It must be read in conjunction with the Front Sheets of BBA Certificate No 98 / 3459.*
- *It will remain valid provided BBA Certificate No 98 / 3459 is valid.*

The Building Regulations 1997/2000 Ireland

In the opinion of the BBA, Protan Mechanically Fastened PVC Roof Membranes, if used in accordance with the provisions of Certificate No 98/3459, will satisfy or contribute to satisfying the relevant requirements.

Requirement:	B4	External fire spread
Comment:		Data obtained from tests to BS 476-3 : 1958 indicate that on suitable substructures the use of the system will enable a roof to be unrestricted under this Requirement. See sections 11.1 and 11.2 of BBA Certificate No 98 / 3459.
Requirement:	C4	Resistance to weather and ground moisture
Comment:		Tests for weather resistance indicate that the product will contribute towards a tiled or slated roof meeting this Requirement. See section 8.1 of BBA Certificate No 98 / 3459.
Requirement:	D1	Materials and workmanship
Comment:		The products are proper materials. See section 13 of BBA Certificate No 98 / 3459.

On behalf of the British Board of Agrément

Date of issue: 21st September 2004

Chief Executive