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**Agrément
Certificate
No 97/3336**
Fourth issue*

Designated by Government
to issue
European Technical
Approvals

PERMAQUIK 6100 MONOLITHIC MEMBRANE

Revêtement d'étanchéité, couche d'étanchéité
Dachabdichtungen, Feuchtigkeitssperre

Product



South Bank of the River Thames in Southwark

- THIS CERTIFICATE RELATES TO PERMAQUIK 6100 MONOLITHIC MEMBRANE, A ONE-PART, HOT-APPLIED RUBBERISED BITUMEN MEMBRANE.

- This system is for use on inverted or protected flat roofs with limited access, new or existing horizontal and vertical surfaces to form a sandwich membrane for above-ground and basement waterproofing on a structure of concrete, brickwork, blockwork or masonry, to form a damp-proof membrane for solid floors.

- The membrane is manufactured by Permaquik Corporation in Canada and marketed in the UK by the Certificate holder.

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 and basement waterproofing systems with the Building Regulations. In the opinion of the BBA, Permaquik 6100 Monolithic Membrane, if used in accordance with the provisions of this Certificate, will meet or contribute to meeting the relevant requirements.

Requirement: **B4(2)**

Comment:

External fire spread

On flat roofs, the product, when used in an inverted roof specification including a minimum surface finish of 50 mm of aggregate, may be deemed to be of designation AA. See the tinted areas of the *Properties in relation to fire* section of the relevant accompanying Detail Sheet.

Requirement: **C2(a)(b)**

Comment:

Resistance to weather and ground moisture

Tests for water resistance on the membrane indicate that the material meets this Requirement. See the tinted areas of the *Weather-tightness* section of the accompanying Detail Sheets. Materials and workmanship

Requirement: **Regulation 7**

Comment:

The product is an acceptable material. See the tinted areas in the *Durability* section of the accompanying Detail Sheets.

continued

- Installation is carried out by trained contractors (using specialist equipment) approved by the Certificate holder.

These Front Sheets must be read in conjunction with the accompanying Detail Sheets, which provide information specific to the particular application.

2 The Building (Scotland) Regulations 2004



In the opinion of the BBA, the Permaquik 6100 Monolithic Membrane, 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:	8	Fitness and durability of materials and workmanship
Regulation:	8(1)	Fitness and durability of materials and workmanship
Comment:		The product can contribute to a construction meeting this Regulation. See the tinted areas in the <i>Durability</i> section and the <i>Installation</i> parts of the accompanying Detail Sheets.
Regulation:	9	Building standards — construction
Standard:	2.8	Spread from neighbouring buildings
Comment:		On flat roofs, the product, when used in an inverted roof specification including a minimum surface protection of 50 mm of aggregate, may be considered of designation AA and satisfy the requirements of this Standard, with reference to clause 2.8.1 ⁽¹⁾⁽²⁾ . See the tinted areas of the <i>Properties in relation to fire</i> section of the relevant accompanying Detail Sheet.
Standard:	3.4	Moisture from the ground
Comment:		The product can enable a floor to satisfy the requirements of this Standard, with reference to clauses 3.4.1 ⁽¹⁾⁽²⁾ , 3.4.2 ⁽¹⁾⁽²⁾ and 3.4.4 ⁽¹⁾⁽²⁾ to 3.4.7 ⁽¹⁾⁽²⁾ respectively. See the tinted area of the <i>Weathertightness</i> section of Detail Sheet 3.
Standard:	3.10	Precipitation
Comment:		Tests for water resistance on the membrane indicate that the use of the product can enable a roof to satisfy the requirements of this Standard, with reference to clauses 3.10.1 ⁽¹⁾⁽²⁾ and 3.10.6 ⁽¹⁾⁽²⁾ . See the tinted area of the <i>Weathertightness</i> section of Detail Sheet 2.
Regulation:	12	Building standards — conversions
Comment:		All comments given for this product under Regulation 9, also apply to this Regulation, with reference to clause 0.12.1 ⁽¹⁾⁽²⁾ and Schedule 6 ⁽¹⁾⁽²⁾ . (1) Technical Handbook (Domestic). (2) Technical Handbook (Non-Domestic).

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



In the opinion of the BBA, the Permaquik 6100 Monolithic Membrane, 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 product is an acceptable material. See the tinted areas in the <i>Durability</i> section of the accompanying Detail Sheets.
Regulation:	C4	Resistance to ground moisture and weather
Comment:		Tests for water resistance of the membrane indicate that the use of the product can enable a roof or floor to satisfy the requirements of this Regulation. See the tinted areas of the <i>Weathertightness</i> section of the accompanying Detail Sheets.
Regulation:	E5	External fire spread
Comment:		On flat roofs, the product, when used in an inverted roof specification including a minimum surface protection of 50 mm of aggregate, may be considered of designation AA. See the tinted areas of the <i>Properties in relation to fire</i> section of the relevant accompanying Detail Sheet.

4 Construction (Design and Management) Regulations 2007

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

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

See sections: 6 *Delivery and site handling* (6.1 and 6.2 of these Front Sheets).

5 Description

5.1 Permaquik 6100 Monolithic Membrane is a roofing and damp-proofing system manufactured by heating and blending together polymer-modified bitumen, processing oils, fillers and other additives.

5.2 PQ 2016 is a 50 gm⁻² spunbonded polyester fabric and PQ 2047 an elastomeric membrane (butyl rubber) and are for use as a reinforcing to the membrane.

5.3 Ancillary products used with the membrane include:

- PQ 2063 — a 1.45 mm thick elastomeric membrane, used to reinforce the membrane at expansion joints where movement is likely to occur, and for details and upstands
- polythene sheet — 0.01 mm thick for use as separating layer (only as part of insulated roof membrane assembly, and only light foot traffic to be allowed over the area)
- PQ 2250 — bitumen protection board
- PQ 2450 — polypropylene protection board
- Primer PQ 6109 — for surface conditioning of concrete and brickwork.

5.4 Quality control checks are performed on incoming raw materials, during production, and on the finished product. Checks include:

- penetration
- viscosity
- weight
- grain size
- flow
- cold bend
- specific gravity
- low temperature flexibility.

6 Delivery and site handling

6.1 Permaquik is delivered to site in 205 litre drums or 22 kg cakes in cardboard cartons bearing the product name, the manufacturer's name and the BBA identification mark incorporating the number of this Certificate.

6.2 Each drum contains 10 cakes of membrane, individually double-wrapped in disposable polythene film. Each cake has a nominal weight of between 22 kg and 25 kg.

6.3 Unused cakes of the membrane should be stored in the sealed drums. The material is not affected by the temperatures likely to occur during storage.

6.4 Reinforcing materials should be stored under cover and kept dry.

7 Adhesion

7.1 Test data indicate that the adhesion of the Permaquik 6100 Monolithic Membrane to substrates is satisfactory.

7.2 When used over construction or bridging joints, the membrane can accommodate the minor structural movement likely to occur under normal service conditions. The methods described in sections 7.4 and 7.5 of Detail Sheet 2 and section 6.4 of Detail Sheet 3 should be followed.

8 Effects of temperature

Providing the substrate is dry and frost free, the membrane can be installed down to the lowest possible site working temperatures found in the United Kingdom.

9 Maintenance

Damage to the membrane can be adequately repaired by patching in accordance with the manufacturer's instructions.

Conditions of Certification

10 Conditions

10.1 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.

10.2 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.

10.3 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
- continue to be checked as and when deemed appropriate by the BBA under arrangements that it will determine
- are reviewed by the BBA as and when it considers appropriate.

10.4 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.

10.5 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.



In the opinion of the British Board of Agrément, the Permaquik 6100 Monolithic Membrane is fit for its intended use provided it is installed, used and maintained as set out in this Certificate. Certificate No 97/3336 is accordingly awarded to Radmat Building Products Ltd.

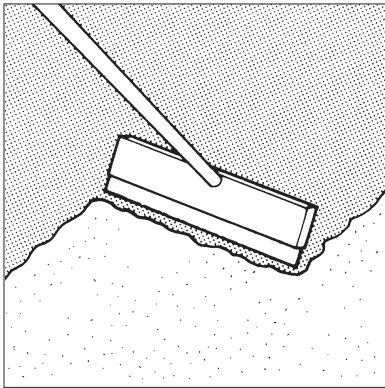
On behalf of the British Board of Agrément

Date of Fourth issue: 13th April 2007

Chief Executive

**Original Certificate issued on 4th March 1997. This amended version includes references to the revised national Building Regulations and new Conditions of Certification.*

Product



- THIS DETAIL SHEET RELATES TO THE PERMAQUIK 6100 MONOLITHIC MEMBRANE ROOFING SYSTEM.
- The system is for use on flat roofs with limited access in either an inverted roof specification or a protected roof specification (eg covered by pavers or other suitable protection).

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

Design Data

1 General

1.1 The Permaquik 6100 Monolithic Membrane Roofing System is satisfactory for use on flat, limited or pedestrian access roofs as:

- a waterproofing layer in an inverted roof specification.
- a waterproofing layer protected by pavers or other suitable protection.
- a waterproofing layer (tanking specification) on a flat roof with a zero fall slope.

1.2 Limited access roofs are defined for the purpose of this Certificate as those roofs subjected only to pedestrian traffic for such duties as maintenance of the roof covering and cleaning of gutters. Where traffic in excess of this is envisaged, special precautions such as additional protection to the membrane must be taken.

1.3 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. Completely flat roofs are defined for the purpose of this Certificate as those roofs having a finished fall of less than 1:80.

1.4 When designing flat roofs, twice the minimum finished fall should be assumed, unless a detailed analysis of the roof is available, including such information as overall and local deflection, and direction of falls.

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

- 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.

1.6 Precast concrete and concrete block decks to which the product is to be applied must comply with the relevant requirements of BS 6229 : 2003, BS 8217 : 2005 and, where appropriate, NHBC Standards, Chapter 7.1 or the *Zurich Building Guarantee Technical Manual*, Section 5 *Internal/external works, services and finishes*, clause 5.9.3.19.

2 Weathertightness

2.1 Data examined confirm that when completely sealed and consolidated, the membrane will adequately resist the passage of moisture to the inside of the building and so meet or satisfy the relevant requirements of the national Building Regulations:

England and Wales

Approved Document C, Requirement C2(b), Section 5.1

Scotland

Mandatory Standard 3.10, with references to clauses 3.10.1⁽¹⁾⁽²⁾ and 3.10.6⁽¹⁾⁽²⁾

(1) Technical Handbook (Domestic).

(2) Technical Handbook (Non-Domestic).

Northern Ireland

Regulation C4.

2.2 The membrane is impervious to water and, when used in the systems described, will give a waterproofing layer capable of accepting minor structural movements without damage.

3 Resistance to foot traffic

3.1 From tests it is indicated that provided there are no sharp objects present on the membrane's surface prior to and during installation of the protective layer above, it will not be damaged by normal foot traffic.

3.2 The membrane can accept, without damage, distributed loads. Concentrated point loads can cause damage and should be avoided.

4 Properties in relation to fire



4.1 The membrane, when used in an inverted roof specification including a minimum surface finish of 50 mm of aggregate, shall be deemed to meet BS 476-3 : 1958 designation EXT F.A.A.

4.2 The membrane is always used under a protective surface finish. The fire rating of the roof is dependent on the finish and insulation used, the designation of which should be confirmed by:

England and Wales

test or assessment in accordance with the Approved Document B, Appendix A, Clause A1

Scotland

Mandatory Standard 2.8, with reference to 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.

5 Durability



5.1 Permaquik 6100 Roof Waterproofing Membrane, when fully protected and subject to normal service conditions, will provide an effective barrier to the transmission of liquid water and water vapour for the design life of the roof in which it is incorporated.

5.2 However, in situations where maintenance or repair of any of the components in the roof structure are necessary (eg protection layer, insulation, or deck), the durability of the membrane may be reduced. In these circumstances the Certificate holder should be consulted.

Installation

6 General

6.1 The Permaquik 6100 Monolithic Membrane Roofing System must be installed in accordance with the relevant clauses of the Certificate holder's instructions, on a dry and frost-free substrate. After rain or snow, at least one full day of good drying conditions must be allowed before installation can

recommence. Once applied, the membrane is not affected by rain, snow or frost.

6.2 To assess the suitability of a substrate to receive the membrane, initial tests must be carried out. If bonding problems occur, advice should be sought from the Certificate holder.

6.3 Prior to the application of the membrane to the substrate, defects such as cracks, irregularities, and areas of potential weakness should be made good, and the substrate cleaned. Any gaps, irregularities and areas of potential weakness may be filled with latex modified repair mortar. Where faults are not critical, additional membrane may be used to fill in.

6.4 The substrate should be conditioned with Primer PQ 6109 or other Radmat approved bitumen primer (at a coverage rate between 7 m²l⁻¹ and 11.5 m²l⁻¹) and allowed to dry before application of the membrane.

6.5 Permaquik 6100 will adhere to metal, plywood and timber details. Metal should be free from oil, rust, paint or other coatings liable to affect the bond.

6.6 The membrane should be covered with a protective layer as soon as possible after installation, in accordance with the manufacturer's instructions.

7 Procedure

7.1 Cakes of the membrane are heated in a propane-fired, mechanically-agitated heater which has a double jacket containing a heat transfer mineral oil, and is fitted with thermometers to measure the melt and oil temperatures.

7.2 The nominal temperature range for the molten membrane is 190°C to 205°C. The temperature of the melt should never exceed 215°C.

7.3 The melt is discharged from the heater into a suitable container and applied to the roof using long-handled, rubber-bladed squeegees or by brush on small areas.

7.4 The membrane, when used over construction joints, should be reinforced with PQ 2016 polyester scrim.

7.5 When used over bridging joints, the membrane should be reinforced with PQ 2047/2063 butyl rubber.

7.6 The first layer of membrane should have a minimum thickness of 3 mm.

7.7 The PQ 2016 polyester reinforcement should be embedded by lightly brushing it into the first layer of the membrane whilst it is still warm and tacky. The reinforcement overlaps should be at least 75 mm.

7.8 The second layer of membrane, applied over the top of the reinforcement, should have a minimum thickness of 3 mm.

Technical Investigations

The following is a summary of the technical investigations carried out on the Permaquik 6100 Monolithic Membrane Roofing System.

8 Tests

Samples of Permaquik 6100 Monolithic Membrane Roofing System PQ 2016, PQ 2047 and PQ 2063 reinforcing scrim were obtained from the manufacturer for the purpose of testing. Tests performed by the BBA, which give typical results for the materials, are summarised in Tables 1 to 4.

9 Investigations

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

9.2 Visits were made to sites to assess the practicability of installation.

Table 1 Physical properties of reinforcements

Test (units)	Method ⁽¹⁾	Mean result
Thickness (mm)	MOAT 31 : 6A	
PQ 2016		0.23
PQ 2047		1.10
PQ 2063		1.45
Weight per unit area (kgm ⁻²) surface area	MOAT 31 : 6B	
PQ 2016		0.05
PQ 2047		1.57
PQ 2063		2.09
Tensile strength (N per 50 mm)	MOAT 31 : 6C	
PQ 2016		38.0
PQ 2047		
longitudinal		289
transverse		264
PQ 2063		
longitudinal		390
transverse		369
Elongation at break (%)	MOAT 31 : 6C	
PQ 2016		33
PQ 2047		
longitudinal		463
transverse		497
PQ 2063		
longitudinal		413
transverse		437

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

Table 2 Physical properties — on membrane only

Test (units)	Method ⁽¹⁾	Mean result
Fines content (%)	MOAT 31 : 6F	46.3
Oil loss (%)		0.02
Density (gcm ⁻³)	ISO 1183	1.33
Moisture absorption (%)	BS 2782-4 : 430A	0
Ring and ball softening point (°C) unaged	BS 2000-58	110
Heat aged 56 days at 70°C		102
Heat aged 180 days at 70°C		92
Resistance to imposed load (mm) at termination of test (hrs)	<i>ad hoc</i> ⁽²⁾	
5 kg		0.90 (102)
10 kg		1.56 (143)
20 kg		3.67 (457)

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

(2) Samples 6 mm thick on 300 mm by 300 mm concrete slabs. Loads of 5 kg, 10 kg and 20 kg were applied to 150 mm by 150 mm steel plates placed on the samples at 23°C, and indentation with time was recorded.

Table 3 Physical properties of system

Test (units)	Method ⁽¹⁾	Mean result
Low temperature flexibility (°C)	MOAT 31 : 6D	
PQ 2016		-15
PQ 2063		-10
Aged ⁽²⁾		
PQ 2016		-10
PQ 2063		-5
Aged ⁽³⁾		
PQ 2016		10
PQ 2063		23
Aged ⁽⁴⁾		
PQ 2016		-15
PQ 2063		-10

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

(2) Aged for 56 days at 23°C.

(3) Aged for 180 days at 23°C.

(4) 7 days water soak at 23°C.

Table 4 Service performance of the system

Test (units)	Method ⁽¹⁾	Mean result
Water vapour permeability ⁽²⁾ 75% RH/25°C (gm ⁻² day ⁻¹)	BS 3177	0.17
Water vapour resistance (MNsg ⁻¹) ⁽²⁾	BS 3177	1207
Resistance to cracking at 0°C PQ 2016 PQ 2063	DOT Spec, Part C(iv)	no cracks no cracks
at 20°C PQ 2016 PQ 2063		no cracks no cracks
Resistance to static indentation PQ 2016 (concrete) PQ 2063 (concrete)	MOAT 27 : 5.1.9	L ₃ L ₃
Resistance to dynamic indentation PQ 2016 (perlite cellulose) PQ 2063 (perlite cellulose)	MOAT 27 : 5.1.10	L ₃ L ₄
Resistance to water pressure PQ 2016	MOAT 27 : 5.1.4	no leakage
Tensile bond strength (Nmm ⁻²) PQ 2063 ⁽³⁾ unaged aged ⁽⁴⁾ aged ⁽⁵⁾	DOT Spec, Part C(vii)	0.24 0.32 0.12

- (1) The test documents are detailed in the *Bibliography*. Numbers in the table refer to sections/parts of the various documents.
- (2) Membrane reinforced with PQ 2016 scrim.
- (3) System applied on 150 mm by 230 mm concrete blades.
- (4) Aged for 7 days at 70°C.
- (5) 28 days water soak at 23°C.

Bibliography

- BS 476-3 : 1958 *Fire tests on building materials and structures — External fire exposure roof test*
- BS 2000-58 : 1993 *Methods of test for petroleum and its products — Determination of softening point of bitumen — Ring and ball method*
- BS 2782-4.430A to 430D : 1983 *Methods of testing plastics — Chemical properties — Determination of water absorption at 23°C — Determination of water absorption at 23°C with allowance for water-soluble matter — Determination of boiling water absorption — Determination of boiling water absorption with allowance for water-soluble matter*
- 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 8217 : 2005 *Reinforced bitumen membranes for roofing — Code of practice*
- 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*
- ISO 1183 : 1987 *Plastics — Method for determining the density and relative density of non-cellular plastics*
- DOT Spec, Part C BE 27 *Department of Transport Checks and Tests for the Approval of Waterproofing Systems for Concrete Decks to Highway Bridges*



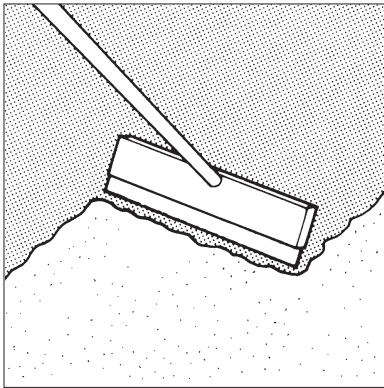
On behalf of the British Board of Agrément

Date of Fourth issue: 13 April 2007

Chief Executive

*Original Detail Sheet issued on 4th March 1997. This amended version includes reference to revised national Building Regulations.

Product



- THIS DETAIL SHEET RELATES TO THE PERMAQUIK 6100 MONOLITHIC MEMBRANE DAMP-PROOFING SYSTEM.
- The system is for use on new or existing horizontal and vertical surfaces to form a sandwich membrane for above-ground and basement waterproofing on a structure of concrete, brickwork, blockwork or masonry, or to form a damp-proof membrane for solid floors.

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

Design Data


1 General

1.1 The Permaquik 6100 Monolithic Membrane Damp-proofing System is satisfactory for use as a sandwich membrane, for above- and below-ground waterproofing within a structure of concrete, brickwork, blockwork or masonry, or as a damp-proof membrane for solid floors.

1.2 The membrane is compatible with the substrate and is resistant to those chemicals likely to occur in normal practice.

1.3 Where contact with materials used as damp-proof courses is likely, consideration must be given to the thermal stability of that material, due to the high temperatures reached during installation.

2 Weathertightness

 2.1 Data examined confirm that when completely sealed and consolidated, the membrane will adequately resist the passage of moisture to the inside of the building and so meet or satisfy the relevant requirements of the national Building Regulations:

England and Wales

Approved Document C, Requirement C2(a), section 4.7

Scotland

Mandatory Standard 3.4, clauses 3.4.1⁽¹⁾⁽²⁾, 3.4.2⁽¹⁾⁽²⁾ and 3.4.4⁽¹⁾⁽²⁾ to 3.4.7⁽¹⁾⁽²⁾

(1) Technical Handbook (Domestic).

(2) Technical Handbook (Non-Domestic).

Northern Ireland

Regulation C4.

2.2 The membrane is impervious to water and will act as a waterproofing layer capable of accepting minor structural movements without damage.

3 Resistance to puncture

3.1 Data indicate that provided there are no sharp objects present on the membrane's surface prior to and during installation of the protective layer, Permaquik 6100 will not be damaged by normal foot traffic.

3.2 Whilst the membrane can withstand distributed loads, it can be damaged by concentrated point loads and these should be avoided.

4 Durability



Permaquik 6100 Monolithic Membrane, when fully protected and subjected to normal service conditions, will provide an effective barrier to the transmission of liquid water and water vapour for the design life of the structure in which it is incorporated.

Installation

5 General

5.1 The Permaquik 6100 Monolithic Membrane Damp-proofing System must be installed in accordance with the relevant requirements of CP 102 : 1973, BS 8102 : 1990 and the manufacturer's instructions.

5.2 Concrete or screeded surfaces should have a smooth finish, free from loosely adhering material

and sharp protrusions. Concrete should be dry and dust free. Surfaces should be conditioned with Primer PQ 6109 or other Radmat approved bitumen primer (at a coverage rate of between $7 \text{ m}^2\text{-}^1$ and $11.5 \text{ m}^2\text{-}^1$) and allowed to dry before application of membrane.

5.3 Vertical surfaces of brickwork and blockwork should be rendered to provide an even surface. Brickwork or blockwork not rendered must be flush pointed to give a smooth surface without sudden changes in level.

5.4 Permaquik 6100 must be covered with a protective layer, in accordance with the Certificate holder's instructions, as soon as possible after installation.

6 Procedure

6.1 The membrane is heated in a propane-fired, mechanically-agitated heater, which has a double jacket containing a heat transfer mineral oil, and is fitted with thermometers to measure the melt and oil temperatures.

6.2 The nominal temperature range for the molten membrane is between 190°C and 205°C . The temperature of the melt should never exceed 215°C .

6.3 The melt is discharged from the heater into a container capable of holding the melt, and applied to the surface using long-handled, rubber-bladed squeegees, or by brush on small areas.

6.4 When used over construction joints the membrane should be reinforced with a strip of PQ 2016 polyester scrim incorporated into the membrane. When used over bridging joints the membrane should also be reinforced with PQ 2047/2063 butyl rubber.

6.5 The minimum thickness of the first layer of the membrane should be 3 mm.

6.6 The PQ 2016 polyester reinforcement should be embedded by lightly brushing into the first layer while it is still warm and tacky. The reinforcement overlaps should be at least 75 mm.

6.7 The second coat of membrane applied over the top of the reinforcement should be a minimum thickness of 3 mm.

Technical Investigations

The following is a summary of the technical investigations carried out on the Permaquik 6100 Monolithic Membrane Damp-proofing System.

7 Tests

Samples of Permaquik 6100 Monolithic Membrane Damp-proofing System PQ 2016, PQ 2047 and PQ 2063 reinforcing materials were obtained from the manufacturer for testing. The results of tests carried out by the BBA, which give typical results for the material, are summarised in Tables 1 to 4.

8 Investigations

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

8.2 Visits were made to sites to assess the practicability of installation.

Table 1 Physical properties of reinforcements

Test (units)	Method ⁽¹⁾	Mean result
Thickness (mm)	MOAT 31 : 6A	
PQ 2016		0.23
PQ 2047		1.10
PQ 2063		1.45
Weight per unit area (kgm^{-2}) surface area	MOAT 31 : 6B	
PQ 2016		0.05
PQ 2047		1.57
PQ 2063		2.09
Tensile strength (N per 50 mm)	MOAT 31 : 6C	
PQ 2016		38.0
PQ 2047		
longitudinal		289
transverse		264
PQ 2063		
longitudinal		390
transverse		369
Elongation at break (%)	MOAT 31 : 6C	
PQ 2016		33
PQ 2047		
longitudinal		463
transverse		497
PQ 2063		
longitudinal		413
transverse		437

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

Table 2 Physical properties — on membrane only

Test (units)	Method ⁽¹⁾	Mean result
Fines content (%)	MOAT 31 : 6F	46.3
Oil loss (%)		0.02
Density (gcm ⁻³)	ISO 1183	1.33
Moisture absorption (%)	BS 2782-4 : 430A	0
Ring and ball softening point (°C) unaged	BS 2000-58	110
Heat aged 56 days at 70°C		102
Heat aged 180 days at 70°C		92
Resistance to imposed load (mm) at termination of test (hrs)	<i>ad hoc</i> ⁽²⁾	
5 kg		0.90 (102)
10 kg		1.56 (143)
20 kg		3.67 (457)

- (1) The test documents are detailed in the *Bibliography*. Numbers in the table refer to sections/parts of the various documents.
- (2) Samples 6 mm thick on 300 mm by 300 mm concrete slabs. Loads of 5 kg, 10 kg and 20 kg were applied to 150 mm by 150 mm steel plates placed on the samples at 23°C, and indentation with time was recorded.

Table 3 Physical properties of system

Test (units)	Method ⁽¹⁾	Mean result
Low temperature flexibility (°C)	MOAT 31 : 6D	
PQ 2016		-15
PQ 2063		-10
Aged ⁽²⁾		
PQ 2016		-10
PQ 2063		-5
Aged ⁽³⁾		
PQ 2016		10
PQ 2063		23
Aged ⁽⁴⁾		
PQ 2016		-15
PQ 2063		-10

- (1) The test document is detailed in the *Bibliography*. Numbers in the table refer to sections/parts of the document.
- (2) Aged for 56 days at 23°C.
- (3) Aged for 180 days at 23°C.
- (4) 7 days water soak at 23°C.

Table 4 Service performance of the system

Test (units)	Method ⁽¹⁾	Mean result
Water vapour permeability ⁽²⁾ 75% RH/25°C (gm ⁻² day ⁻¹)	BS 3177	0.17
Water vapour resistance (MNsg ⁻¹) ⁽¹⁾	BS 3177	1207
Resistance to cracking at 0°C	DOT Spec, Part C(iv)	
PQ 2016		no cracks
PQ 2063		no cracks
at 20°C		
PQ 2016		no cracks
PQ 2063		no cracks
Resistance to static indentation	MOAT 27 : 5.1.9	
PQ 2016 (concrete)		L ₃
PQ 2063 (concrete)		L ₃
Resistance to dynamic indentation	MOAT 27 : 5.1.10	
PQ 2016 (perlite cellulose)		L ₃
PQ 2063 (perlite cellulose)		L ₄
Resistance to water pressure	MOAT 27 : 5.1.4	
PQ 2016		no leakage
Tensile bond strength (Nmm ⁻²)	DOT Spec, Part C(vii)	
PQ 2063 ⁽³⁾		
unaged		0.24
aged ⁽⁴⁾		0.32
aged ⁽⁵⁾		0.12

- (1) The test documents are detailed in the *Bibliography*. Numbers in the table refer to sections/parts of the various documents.
- (2) Membrane reinforced with PQ 2016 scrim.
- (3) System applied on 150 mm by 230 mm concrete blades.
- (4) Aged for 7 days at 70°C.
- (5) 28 days water soak at 23°C.

Bibliography

BS 2000-58 : 1993 *Methods of test for petroleum and its products — Determination of softening point of bitumen — Ring and ball method*

BS 2782-4.430A to 430D : 1983 *Methods of testing plastics — Chemical properties — Determination of water absorption at 23°C — Determination of water absorption at 23°C with allowance for water-soluble matter — Determination of boiling water absorption — Determination of boiling water absorption with allowance for water-soluble matter*

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

BS 8102 : 1990 *Code of practice for protection of structures against water from the ground*

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*

CP 102 : 1973 *Code of practice for protection of buildings against water from the ground*

ISO 1183 : 1987 *Plastics — Method for determining the density and relative density of non-cellular plastics*

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On behalf of the British Board of Agrément

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