

**Icopal Ltd**

Barton Dock Road  
Stretford  
Manchester M32 0YL

Tel: 0161-865 4444 Fax: 0161-865 8433  
e-mail: ukoba@icopal.co.uk  
website: www.icopal.co.uk



Agrément Certificate  
No 00/3668

## MONARFLEX GAS-RESISTANT DAMP-PROOF MEMBRANES

### PRODUCT SHEET 1 — REFLEX SUPER GAS-RESISTANT DAMP-PROOF MEMBRANE

#### PRODUCT SCOPE AND SUMMARY OF CERTIFICATE

This Certificate relates to Reflex Super Gas-Resistant Damp-Proof Membrane, for use as a damp-proof membrane and to restrict the ingress of radon, methane and carbon dioxide gases into buildings through the ground-floor slab from naturally occurring sources and/or landfill.

#### AGRÉMENT CERTIFICATION INCLUDES:

- factors relating to compliance with UK 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

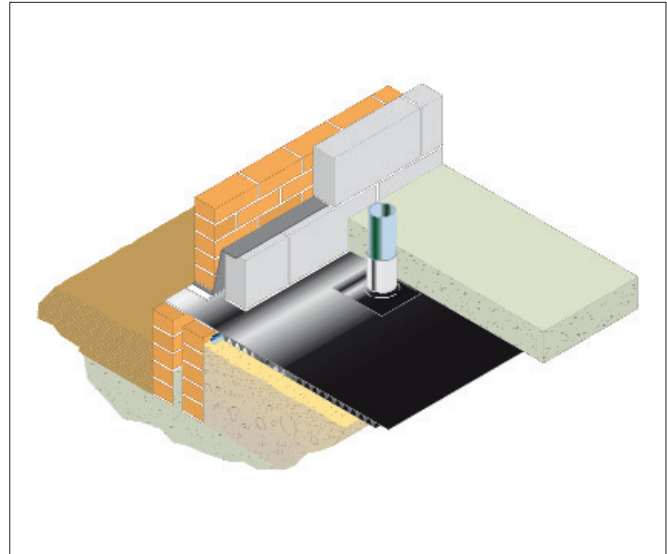
**Resistance to water and water vapour** — the membrane provides an effective barrier to the passage of liquid water and water vapour from the ground (see section 4).

**Resistance to underground gases** — the membrane is capable of restricting the ingress of radon, methane and carbon dioxide gases (see section 5).

**Resistance to puncture** — the membrane has high resistance to puncture and on a smooth or blinded surface will not be damaged by foot or site traffic (see section 6).

**Compatibility with other materials** — under normal circumstances the membrane is compatible with other building materials typically used in the same areas with the exception of products containing pitch (see section 7).

**Durability** — under normal service conditions the membrane will remain effective against the ingress of water and water vapour and will restrict the ingress of radon, methane and carbon dioxide during the lifetime of the concrete slab in which they are installed (see section 9).



The BBA has awarded this Agrément Certificate for Reflex Super Gas-Resistant Damp-Proof Membrane to Icopal Ltd as fit for its intended use provided it is installed, used and maintained as set out in this Agrément Certificate.

On behalf of the British Board of Agrément

Date of First issue: 18 February 2000

Date of Second issue: 20 December 2007

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](http://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.*

British Board of Agrément  
Bucknalls Lane  
Garston, Watford  
Herts WD25 9BA

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tel: 01923 665300  
fax: 01923 665301  
e-mail: [mail@bba.star.co.uk](mailto:mail@bba.star.co.uk)  
website: [www.bbacerts.co.uk](http://www.bbacerts.co.uk)

# Regulations

In the opinion of the BBA, Reflex Super Gas-Resistant Damp-Proof Membrane, 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:	C1(2)	Site preparation and resistance to contaminants
Comment:		The product can contribute to a structure satisfying the requirements of this Requirement. See sections 5.1 and 5.2 of this Certificate.
Requirement:	C2(a)	Resistance to moisture
Comment:		When properly installed in a correctly designed structure, the product forms an effective barrier to the movement of water within the ground-floor slab, enabling compliance with this Requirement. See sections 4.1 and 4.2 of this Certificate.
Requirement:	Regulation 7	Materials and workmanship
Comment:		The product is an acceptable material. See section 9 of this Certificate.



## The Building (Scotland) Regulations 2004 (as amended)

Regulation:	8	<b>Fitness and durability of materials and workmanship</b>
Regulation:	8(1)	Fitness and durability of materials and workmanship
Comment:		The product can contribute to a construction satisfying this Regulation. See section 9 and the <i>Installation</i> part of this Certificate.
Regulation:	9	<b>Building standards – construction</b>
Standard:	3.1	Site preparation – harmful and dangerous substances
Standard:	3.2	Site preparation – protection from radon gas
Comment:		When properly installed in a correctly designed structure, the product forms an effective barrier to the movement of radon, methane and carbon dioxide gases within the ground-floor slab, enabling compliance with these Standards, with reference to clauses 3.1.2 <sup>(1)(2)</sup> , 3.1.6 <sup>(1)(2)</sup> , 3.1.7 <sup>(1)(2)</sup> , 3.1.8 <sup>(1)(2)</sup> , 3.2.1 <sup>(2)</sup> and 3.2.2 <sup>(1)(2)</sup> . See sections 5.1 and 5.2 of this Certificate.
Standard:	3.4	Moisture from the ground
Comment:		When properly installed in a correctly designed structure, the product forms an effective barrier to the movement of water within the ground-floor slab, enabling compliance with this Standard, with reference to clauses 3.4.2 <sup>(1)(2)</sup> , 3.4.4 <sup>(1)(2)</sup> and 3.4.6 <sup>(1)(2)</sup> . See sections 4.1 and 4.2 of this Certificate.
Regulation:	12	<b>Building standards – conversions</b>
Comment:		All comments given for this product under Regulation 9, also apply to this Regulation, with reference to clause 0.12.1 <sup>(1)(2)</sup> and Schedule 6 <sup>(1)(2)</sup> . (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 product is an acceptable material. See section 9 of this Certificate.
Regulation:	C2(a)	Preparation of site and resistance to dangerous and harmful substances
Comment:		The product can contribute to a structure satisfying the requirements of this Regulation. See sections 5.1 and 5.2 of this Certificate.
Regulation:	C4(a)	Resistance to ground moisture and weather
Comment:		When properly installed in a correctly designed structure, the product forms an effective barrier to the movement of water within the ground-floor slab, enabling compliance with this Regulation. See sections 4.1 and 4.2 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* (1.3).

# Non-regulatory Information

## NHBC Standards 2007

NHBC accepts the use of Reflex Super Gas-Resistant Damp-Proof Membrane, when installed and used in accordance with this Certificate in relation to *NHBC Standards*, Chapters 4.1 *Land quality – managing ground conditions* and 5.1 *Substructure and ground bearing floors*.

# Zurich Building Guarantee Technical Manual 2007

In the opinion of the BBA, Reflex Super Gas-Resistant Damp-Proof Membrane, when installed and used in accordance with this Certificate, satisfies the requirements of the *Zurich Building Guarantee Technical Manual*, Section 3 *Substructure*.

## General

This Certificate relates to Reflex Super Gas-Resistant Damp-Proof Membrane, for use as a damp-proof membrane and to restrict the ingress of radon, methane and carbon dioxide gases into buildings through the ground-floor slab from naturally occurring sources and/or landfill.

## Technical Specification

### 1 Description

1.1 Reflex Super Gas-Resistant Damp-Proof Membrane is a 0.4 mm thick, seven-layer polyethylene membrane incorporating encapsulated aluminium foil and a reinforcing grid.

1.2 The top surface of the membrane is sand-coloured and ribbed, the underside is silver and has a smooth finish.

1.3 The membrane has the nominal characteristics of:

Thickness (mm)	0.4
Width (m)	2
Roll length (m)	25, 50
Roll weight (kg) <sup>(1)</sup>	21, 42
Weight per unit area (kgm <sup>-2</sup> )	0.42

(1) Pre-welded sheets are available to order.

1.4 Ancillary products available are:

- Monobond Gas Barrier Sealant Tape — a double-sided tape, 70 mm wide for use joining side and end overlaps of the membranes
- Monobond Self-Adhesive Gas Membrane — for three-dimensional sealing and patching
- Type B primer — water-based primer for sealing dusty or porous surfaces.

1.5 Quality control checks are performed during manufacture and on the final product. Final product checks include tests for:

- width
- thickness
- weight per unit area.

### 2 Delivery and site handling

2.1 Rolls are wrapped in clear polyethylene film, marked with a label bearing the product name, width, length and UK marketing company's address and phone number. The BBA logo and Certificate number are printed on the wrapper.

2.2 Rolls must be stacked on a flat surface, kept under cover and protected from mechanical damage.

2.3 Pre-welded sheets are suitably wrapped in polyethylene film, marked with a label bearing the product name, width, length and UK marketing company's address and phone number. The BBA logo and Certificate number are printed on the wrapper.

## Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on Reflex Super Gas-Resistant Damp-Proof Membrane.

## Design Considerations

### 3 General

3.1 Reflex Super Gas-Resistant Damp-Proof Membrane is satisfactory for use as a damp-proof membrane under concrete, screed and floor slabs in accordance with CP 102 : 1973, Section 2, and to restrict the ingress of radon, methane and carbon dioxide gases into buildings from landfill and naturally occurring sources.

3.2 Buildings in areas of risk from landfill gas should be constructed in accordance with the recommendation of BRE Report 211 *Radon : guidance on protective measures for new dwellings*; BRE Report 212 *Construction of new buildings on gas-contaminated land* and BRE Digest 414 *Protective measures for housing on gas-contaminated land*.

### 4 Resistance to water and water vapour

4.1 The tests confirm that the membrane and joints of membrane, when completely consolidated, will adequately resist the passage of moisture from the ground and so meet the requirement of the national Building Regulations:



**England and Wales** — Approved document C, Requirement C2(a), Section 4.6

**Scotland** — Mandatory Standard 3.4<sup>(1)(2)</sup> clauses 3.4.2<sup>(1)(2)</sup>, 3.4.4<sup>(1)(2)</sup> and 3.4.6<sup>(1)(2)</sup>

(1) Technical Handbook (Domestic).

(2) Technical Handbook (Non-Domestic).

**Northern Ireland** — Regulation C4.

4.2 The membrane is impervious to water and provides a waterproof layer capable of accepting minor structural movements without damage.

## 5 Resistance to underground gases



5.1 Examination of data indicates that Reflex Super Gas-Resistant Damp-Proof Membrane is capable of restricting the ingress of radon, methane and carbon dioxide gases into buildings through the ground-floor slab from naturally occurring sources and/or landfill.

5.2 BRE Reports 211 and 212 recommend 300 µm thick polyethylene sheet as the minimum required thickness for a gas-resistant membrane. It is generally accepted that other materials with comparable or higher gas resistance are suitable, provided they can withstand the construction processes. In the opinion of the BBA, Reflex Super Gas-Resistant Damp-Proof Membrane meets the criteria.

## 6 Resistance to puncture

6.1 The membrane can be punctured by sharp objects and care should be taken when handling building materials over the exposed surface.

6.2 Provided there are no sharp objects present on the membrane's surface prior to and during installation of the protective layer, the product will not be damaged by normal foot traffic.

## 7 Compatibility with other materials

The membrane contains an aluminium foil interply which may be subject to corrosion by alkaline conditions if damage to the membrane and exposure occurs. However, under normal circumstances the membrane is compatible with other materials and products typically used in the same areas with the exception of those containing pitch.

## 8 Effects of temperature

The membrane remains flexible and is capable of being formed at a minimum recommended temperature of  $-12^{\circ}\text{C}$ .

## 9 Durability



Artificial ageing tests indicate that a satisfactory retention of physical properties is achieved. The membrane will, in normal circumstances, remain effective against the ingress of water and water vapour and will restrict the ingress of radon, methane and carbon dioxide during the lifetime of the building.

# Installation

## 10 General

10.1 Reflex Super Gas-Resistant Damp-Proof Membrane must be installed and fixed in accordance with the manufacturer's instructions, the relevant clauses of CP 102 : 1973, Section 2, and BS 8000-4 : 1989.

10.2 The membrane can be installed in all normal site conditions, provided that the air temperature is not below  $-12^{\circ}\text{C}$  to prevent the risk of surface condensation.

## 11 Procedure

11.1 Reflex Super Gas-Resistant Damp-Proof Membrane should be applied to surfaces that have a smooth finish, ie they should be free from voids, projections and mortar deposits. Surfaces should be dry and free from dust and frost.

11.2 Concrete surfaces should be dense. Vertical surfaces of brickwork and blockwork should be dry and 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.

11.3 Where the Monarflex Self-Adhesive Gas Membrane is required (ie on dusty or porous substrates) the surface should be primed with a Type B primer at the recommended coverage rate, and allowed to dry. Vertical surfaces must always be primed.

11.4 The membrane is rolled out, ensuring that it is properly aligned. All end and side overlaps should be a minimum of 150 mm and prepared in accordance with the manufacturer's instructions.

11.5 All joints where possible should be extrusion welded.

11.6 The surface of the damp-proof membrane (dpm) to be lapped should be dry and dust free. To ensure a watertight bond, and gastight integrity, all laps and joints should be extrusion welded where possible. When using Monobond Gas Barrier Sealant Tape, the joints should be pressed down and well rolled.

11.7 All service penetrations and direction changes should be properly detailed. Service ducts should be vented to prevent the possibility of gas accumulating in confined spaces.

11.8 The membrane must extend over the footprint of the building with a stepped damp-proof course separated with a mortar joint.

11.9 The membrane should be covered by a screed or other protective layer as soon as possible after installation. If blockwork protection is used, care must be taken to avoid damage to the membrane during construction.

## 12 Repair

Any damage to the product must be repaired using a patch of the membrane welded in place, or a patch of the Monarflex Self-Adhesive Gas Membrane. All patches must extend a minimum of 150 mm from the damaged area.

# Technical Investigations

## 13 Tests

Samples of Reflex Super Gas-Resistant Damp-Proof Membrane were obtained from the Certificate holder for testing. The results of the tests carried out by the BBA are summarised in Tables 1 and 2.

*Table 1 Physical properties — general*

Test (units)	Mean results	Method <sup>(1)</sup>
Water vapour transmission (75% RH/25°C) (gm <sup>-2</sup> day <sup>-1</sup> )	0.01	BS 3177
Water vapour resistance (MNsg <sup>-1</sup> )	20520	
Chisel impact 20°C 0°C	puncture, full penetration puncture, full penetration	T1/13 <sup>(2)</sup>
Resistance to leakage	no leakage	MOAT 27 : 5.2.1
Tensile strength of joints (N per 50 mm) unaged heat aged <sup>(3)</sup>	271 277	MOAT 27 : 5.2.2

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

(2) BBA test method.

(3) Heat aged at 60°C for 28 days.

*Table 2 Physical properties — directional*

Test (units)	Mean results		Method <sup>(1)</sup>
	Long <sup>(2)</sup>	Trans <sup>(3)</sup>	
Low temperature <sup>(4)</sup> flexibility (°C)	-30	-30	MOAT 27 : 5.4.2
Tensile strength (N per 25 mm) unaged heat aged <sup>(5)</sup> UV ageing <sup>(6)</sup>	271 285 265	270 285 282	BS 2782-3.326E (100 mm min <sup>-1</sup> )
Elongation (at maximum load) (%) unaged heat aged <sup>(5)</sup> UV ageing <sup>(6)</sup>	11.6 12.9 11.7	12.2 12.3 13.8	
Nail tear at maximum load (N) unaged heat aged <sup>(5)</sup>	219 237	231 225	MOAT 27 : 5.4.1
Dimensional stability (%) unrestrained	-1.0	-0.1	MOAT 27 : 5.1.6

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

(2) Longitudinal direction.

(3) Transverse direction.

(4) Lowest non-crack temperature (°C).

(5) Heat aged at 60°C for 56 days.

(6) 100 hours UVB exposure.

### 14 Investigations

14.1 An evaluation was made of data on the permeability of radon, methane and carbon dioxide in relation to the product.

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

14.3 A site visit was conducted to assess the practicability of installation.

## Bibliography

BS 2782-3.326E : 1996 *Methods of testing plastics — Mechanical properties — Plastics — Determination of tensile properties — Test conditions for films and sheets*

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

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

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

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

## 15 Conditions

15.1 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.

15.2 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.

15.3 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.

15.4 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.

15.5 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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## MONARFLEX GAS-RESISTANT DAMP-PROOF MEMBRANES

### PRODUCT SHEET 2 — MONARFLEX RAC GAS-RESISTANT DAMP-PROOF MEMBRANE

#### PRODUCT SCOPE AND SUMMARY OF CERTIFICATE

This Certificate relates to Monarflex RAC Gas-Resistant Damp-Proof Membrane for use as a damp-proof membrane and to restrict the ingress of radon, methane and carbon dioxide gases into buildings through the ground-floor slab from naturally occurring sources and/or landfill.

#### AGRÉMENT CERTIFICATION INCLUDES:

- factors relating to compliance with UK 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

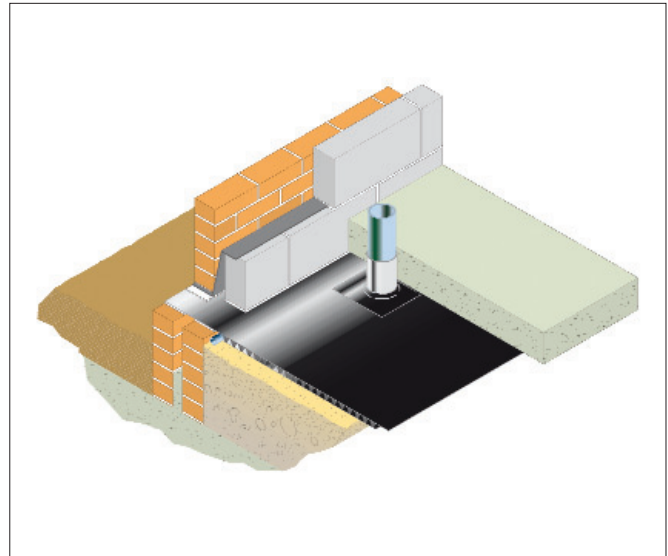
**Resistance to water and water vapour** — the membrane provides an effective barrier to the passage of liquid water and water vapour from the ground (see section 4).

**Resistance to underground gases** — the membrane is capable of restricting the ingress of radon, methane and carbon dioxide gases (see section 5).

**Resistance to puncture** — the membrane has high resistance to puncture and on a smooth or blinded surface will not be damaged by foot or site traffic (see section 6).

**Compatibility with other materials** — under normal circumstances the membrane is compatible with other building materials typically used in the same areas with the exception of products containing pitch (see section 7).

**Durability** — under normal service conditions the membrane will remain effective against the ingress of water and water vapour and will restrict the ingress of radon, methane and carbon dioxide during the lifetime of the concrete slab in which they are installed (see section 9).



The BBA has awarded this Agrément Certificate for Monarflex RAC Gas-Resistant Damp-Proof Membrane to Icopal Ltd as fit for its intended use provided it is installed, used and maintained as set out in this Agrément Certificate.

On behalf of the British Board of Agrément

Date of First issue: 18 February 2000

Date of Second issue: 20 December 2007

Greg Cooper: Chief Executive

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website: [www.bbacerts.co.uk](http://www.bbacerts.co.uk)

# Regulations

In the opinion of the BBA, to Monarflex RAC Gas-Resistant Damp-Proof Membrane, 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:	C1(2)	Site preparation and resistance to contaminants
Comment:		The product can contribute to a structure satisfying the requirements of this Requirement. See sections 5.1 and 5.2 of this Certificate.
Requirement:	C2(a)	Resistance to moisture
Comment:		When properly installed in a correctly designed structure, the product forms an effective barrier to the movement of water within the ground-floor slab, enabling compliance with this Requirement. See sections 4.1 and 4.2 of this Certificate.
Requirement:	Regulation 7	Materials and workmanship
Comment:		The product is an acceptable material. See section 9 of this Certificate.



## The Building (Scotland) Regulations 2004 (as amended)

Regulation:	8	<b>Fitness and durability of materials and workmanship</b>
Regulation:	8(1)	Fitness and durability of materials and workmanship
Comment:		The product can contribute to a construction satisfying this Regulation. See section 9 and the <i>Installation</i> part of this Certificate.
Regulation:	9	<b>Building standards – construction</b>
Standard:	3.1	Site preparation – harmful and dangerous substances
Standard:	3.2	Site preparation – protection from radon gas
Comment:		When properly installed in a correctly designed structure, the product forms an effective barrier to the movement of radon, methane and carbon dioxide gases within the ground-floor slab, enabling compliance with these Standards, with reference to clauses 3.1.2 <sup>(1)(2)</sup> , 3.1.6 <sup>(1)(2)</sup> , 3.1.7 <sup>(1)(2)</sup> , 3.1.8 <sup>(1)(2)</sup> , 3.2.1 <sup>(2)</sup> and 3.2.2 <sup>(1)(2)</sup> . See sections 5.1 and 5.2 of this Certificate.
Standard:	3.4	Moisture from the ground
Comment:		When properly installed in a correctly designed structure, the product forms an effective barrier to the movement of water within the ground-floor slab, enabling compliance with this Standard, with references to clauses 3.4.2 <sup>(1)(2)</sup> , 3.4.4 <sup>(1)(2)</sup> and 3.4.6 <sup>(1)(2)</sup> . See sections 4.1 and 4.2 of this Certificate.
Regulation:	12	<b>Building standards – conversions</b>
Comment:		All comments given for this product under Regulation 9, also apply to this Regulation, with reference to clause 0.12.1 <sup>(1)(2)</sup> and Schedule 6 <sup>(1)(2)</sup> . (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 product is an acceptable material. See section 9 of this Certificate.
Regulation:	C2(a)	Preparation of site and resistance to dangerous and harmful substances
Comment:		The product can contribute to a structure satisfying the requirements of this Regulation. See sections 5.1 and 5.2 of this Certificate.
Regulation:	C4(a)	Resistance to ground moisture and weather
Comment:		When properly installed in a correctly designed structure, the product forms an effective barrier to the movement of water within the ground-floor slab, enabling compliance with this Regulation. See sections 4.1 and 4.2 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* (1.3).

# Non-regulatory Information

## NHBC Standards 2007

NHBC accepts the use of Monarflex RAC Gas-Resistant Damp-Proof Membrane, when installed and used in accordance with this Certificate in relation to *NHBC Standards*, Chapters 4.1 *Land quality – managing ground conditions* and 5.1 *Substructure and ground bearing floors*.

# Zurich Building Guarantee Technical Manual 2007

In the opinion of the BBA, Monarflex RAC Gas-Resistant Damp-Proof Membrane, when installed and used in accordance with this Certificate, satisfies the requirements of the *Zurich Building Guarantee Technical Manual*, Section 3 *Substructure*.

## General

This Certificate relates to Monarflex RAC Gas-Resistant Damp-Proof Membrane, for use as a damp-proof membrane and to restrict the ingress of radon, methane and carbon dioxide gases into buildings through the ground-floor slab from naturally occurring sources and/or landfill.

## Technical Specification

### 1 Description

1.1 Monarflex RAC Gas-Resistant Damp-Proof Membrane is a 0.8 mm thick, six-layer polyethylene membrane incorporating encapsulated aluminium foil and a reinforcing grid.

1.2 The membrane is grey-coloured and has a smooth finish.

1.3 The membrane has the nominal characteristics of:

Thickness (mm)	0.8
Width (m)	2.04
Roll length (m)	25
Roll weight (kg) <sup>(1)</sup>	45
Weight per unit area (kgm <sup>-2</sup> )	0.8

(1) Pre-welded sheets are available to order.

1.4 Ancillary products available are:

- Monobond Gas Barrier Sealant Tape — a double-sided tape, 70 mm wide for use joining side and end overlaps of the membranes
- Monobond Self-Adhesive Gas Membrane — for three-dimensional sealing and patching
- Type B primer — water-based primer for sealing dusty or porous surfaces.

1.5 Quality control checks are performed during manufacture and on the final product. Final product checks include tests for:

- width
- thickness
- weight per unit area.

### 2 Delivery and site handling

2.1 Rolls are wrapped in clear polyethylene film, marked with a label bearing the product name, width, length and UK marketing company's address and phone number. The BBA logo and Certificate number are printed on the wrapper.

2.2 Rolls must be stacked on a flat surface, kept under cover and protected from mechanical damage.

2.3 Pre-welded sheets are suitably wrapped in polyethylene film, marked with a label bearing the product name, width, length and UK marketing company's address and phone number. The BBA logo and Certificate number are printed on the wrapper.

## Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on Monarflex RAC Gas-Resistant Damp-Proof Membrane.

## Design Considerations

### 3 Use

3.1 Monarflex RAC Gas-Resistant Damp-Proof Membrane is satisfactory for use as a damp-proof membrane under concrete, screed and floor slabs in accordance with CP 102 : 1973, Section 2, and to restrict the ingress of radon, methane and carbon dioxide gases into buildings from landfill and naturally occurring sources.

3.2 Buildings in areas of risk from landfill gas should be constructed in accordance with the recommendation of BRE Report 211 *Radon: guidance on protective measures for new dwellings*; BRE Report 212 *Construction of new buildings on gas-contaminated land* and BRE Digest 414 *Protective measures for housing on gas-contaminated land*.

### 4 Resistance to water and water vapour

4.1 The tests confirm that the membrane and joints of membrane, when completely consolidated, will adequately resist the passage of moisture from the ground and so meet the requirement of the national Building Regulations:



**England and Wales** — Approved document C, Requirement C2(a), Section 4.6.

**Scotland** — Mandatory Standard 3.4<sup>(1)(2)</sup> clauses 3.4.2<sup>(1)(2)</sup>, 3.4.4<sup>(1)(2)</sup> and 3.4.6<sup>(1)(2)</sup>

(1) Technical Handbook (Domestic).

(2) Technical Handbook (Non-Domestic).

**Northern Ireland** — Regulation C4.

4.2 The membrane is impervious to water and provides a waterproof layer capable of accepting minor structural movements without damage.

## 5 Resistance to underground gases



5.1 Examination of data indicates that Monarflex RAC Gas-Resistant Damp-Proof Membrane is capable of restricting the ingress of radon, methane and carbon dioxide gases into buildings through the ground-floor slab from naturally occurring sources and/or landfill.

5.2 BRE Reports 211 and 212 recommend 300 µm thick polyethylene sheet as the minimum required thickness for a gas-resistant membrane. It is generally accepted that other materials with comparable or higher gas resistance are suitable, provided they can withstand the construction processes. In the opinion of the BBA, Monarflex RAC Gas-Resistant Damp-Proof Membrane meets the criteria.

## 6 Resistance to puncture

6.1 The membrane can be punctured by sharp objects and care should be taken when handling building materials over the exposed surface.

6.2 Provided there are no sharp objects present on the membrane's surface prior to and during installation of the protective layer, the product will not be damaged by normal foot traffic.

## 7 Compatibility with other materials

The membrane contains an aluminium foil interply which may be subject to corrosion by alkaline conditions if damage to the membrane and exposure occurs. However, under normal circumstances the membrane is compatible with other materials and products typically used in the same areas with the exception of those containing pitch.

## 8 Effects of temperature

The membrane remains flexible and is capable of being formed at a minimum recommended temperature of -12°C.

## 9 Durability



Artificial ageing tests indicate that a satisfactory retention of physical properties is achieved. The membrane will, in normal circumstances, remain effective against the ingress of water and water vapour and will restrict the ingress of radon, methane and carbon dioxide during the lifetime of the building.

# Installation

## 10 General

10.1 Monarflex RAC Gas-Resistant Damp-Proof Membrane must be installed and fixed in accordance with the manufacturer's instructions, the relevant clauses of CP 102 : 1973, Section 2, and BS 8000-4 : 1989.

10.2 The membrane can be installed in all normal site conditions, provided that the air temperature is not below -12°C to prevent the risk of surface condensation.

## 11 Procedure

11.1 Monarflex RAC Gas-Resistant Damp-Proof Membrane should be applied to surfaces that have a smooth finish, ie they should be free from voids, projections and mortar deposits. Surfaces should be dry and free from dust and frost.

11.2 Concrete surfaces should be dense. Vertical surfaces of brickwork and blockwork should be dry and 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.

11.3 Where the Monarflex Self-Adhesive Gas Membrane is required (ie on dusty or porous substrates) the surface should be primed with a Type B primer at the recommended coverage rate, and allowed to dry. Vertical surfaces must always be primed.

11.4 The membrane is rolled out, ensuring that it is properly aligned. All end and side overlaps should be a minimum of 150 mm and prepared in accordance with the manufacturer's instructions.

11.5 All joints where possible should be extrusion welded.

11.6 The surface of the damp-proof membrane (dpm) to be lapped should be dry and dust free. To ensure a watertight bond, and gastight integrity, all laps and joints should be extrusion welded where possible. When using Monobond Gas Barrier Sealant Tape, the joints should be pressed down and well rolled.

11.7 All service penetrations and direction changes should be properly detailed. Service ducts should be vented to prevent the possibility of gas accumulating in confined spaces.

11.8 The membrane must extend over the footprint of the building with a stepped damp-proof course separated with a mortar joint.

11.9 The membrane should be covered by a screed or other protective layer as soon as possible after installation. If blockwork protection is used, care must be taken to avoid damage to the membrane during construction.

## 12 Repair

Any damage to the product must be repaired using a patch of the membrane welded in place, or a patch of the Monarflex Self-Adhesive Gas Membrane. All patches must extend a minimum of 150 mm from the damaged area.

# Technical Investigations

## 13 Tests

Samples of Monarflex RAC Gas-Resistant Damp-Proof Membrane were obtained from the Certificate holder for testing. The results of the tests carried out by the BBA are summarised in Tables 1 and 2.

*Table 1 Physical properties — general*

Test (units)	Mean results		Method <sup>(1)</sup>
	Long <sup>(2)</sup>	Trans <sup>(3)</sup>	
Water vapour transmission (75% RH/25°C) (gm <sup>-2</sup> day <sup>-1</sup> )	0.01		BS 3177
Water vapour resistance (MNsg <sup>-1</sup> )	20520		
Chisel impact 20°C 0°C	severe indentation severe indentation		T1/13 <sup>(2)</sup>
Tensile strength of joints (N per 50 mm) unaged	333		MOAT 27 : 5.2.2

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

(2) BBA test method.

*Table 2 Physical properties — directional*

Test (units)	Mean results		Method <sup>(1)</sup>
	Long <sup>(2)</sup>	Trans <sup>(3)</sup>	
Low temperature <sup>(4)</sup> flexibility (°C)	-30	-30	MOAT 27 : 5.4.2
Tensile strength (N per 25 mm) unaged	393	363	BS 2782-3.326E (100 mm min <sup>-1</sup> )
Change in tensile strength (%) heat aged <sup>(5)</sup> UV ageing <sup>(6)</sup>	5 -2	5 4	
Elongation (at maximum load) (%) unaged	15.8	13.8	
Change in elongation (%) heat aged <sup>(5)</sup> UV ageing <sup>(6)</sup>	11 0.8	0.8 13	
Nail tear at at maximum load (N) unaged	424	449	MOAT 27 : 5.4.1
Change on nail tear (%) heat aged <sup>(5)</sup>	8	-3	
Dimensional stability (%) unrestrained	-0.5	+0.1	MOAT 27 : 5.1.6

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

(2) Longitudinal direction.

(3) Transverse direction.

(4) Lowest non-crack temperature (°C).

(5) Heat aged at 60°C for 56 days.

(6) 100 hours UVB exposure.

### 14 Investigations

14.1 An evaluation was made of data on the permeability of radon, methane and carbon dioxide in relation to the product.

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

14.3 A site visit was conducted to assess the practicability of installation.

## Bibliography

BS 2782-3.326E : 1996 *Methods of testing plastics — Mechanical properties — Plastics — Determination of tensile properties — Test conditions for films and sheets*

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

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

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

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

## 15 Conditions

15.1 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.

15.2 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.

15.3 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.

15.4 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.

15.5 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.

