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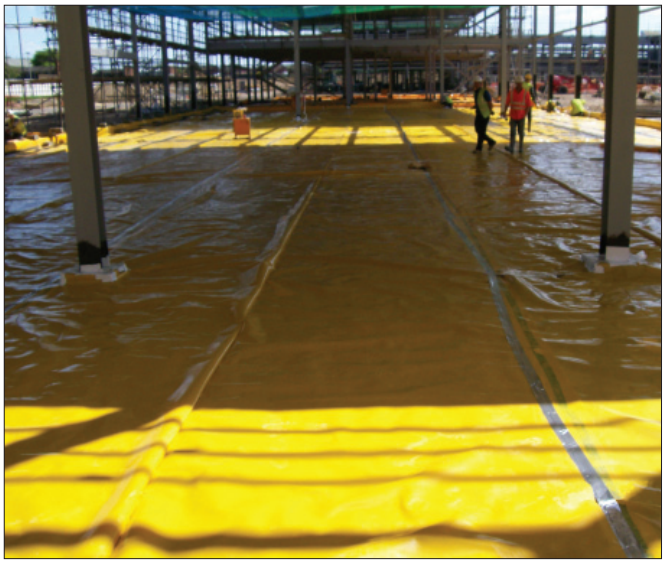
Agrément Certificate
13/5069
Product Sheet 2

VISQUEEN GAS-RESISTANT MEMBRANES

VISQUEEN LOW-PERMEABILITY GAS MEMBRANE

This Agrément Certificate Product Sheet(1) relates to the Visqueen Low-Permeability Gas Membrane, for use as a gas barrier and damp-proof membrane in concrete ground floors, above or below the slab not subject to hydrostatic pressure, to protect the building against moisture, radon, methane and carbon dioxide from the ground.

(1) Hereinafter referred to as 'Certificate'.



CERTIFICATION INCLUDES:

- factors relating to compliance with Building Regulations where applicable
- factors relating to additional non-regulatory information where applicable
- independently verified technical specification
- assessment criteria and technical investigations
- design considerations
- installation guidance
- regular surveillance of production
- formal three-yearly review.

KEY FACTORS ASSESSED

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 6).

Resistance to underground gases — the membrane is capable of restricting the ingress of radon, methane and carbon dioxide gases into the building (see section 7).

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 8).

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 flooring construction in which it is installed (see section 11).

The BBA has awarded this Certificate to the company named above for the product described herein. This product has been assessed by the BBA as being fit for its intended use provided it is installed, used and maintained as set out in this Certificate.

On behalf of the British Board of Agrément

Date of First issue: 10 December 2013

Simon Wroe
Head of Approvals — Materials

Claire Curtis-Thomas
Chief Executive

The BBA is a UKAS accredited certification body — Number 113. The schedule of the current scope of accreditation for product certification is available in pdf format via the UKAS link on the BBA website at www.bbacerts.co.uk

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

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Regulations

In the opinion of the BBA, the Visqueen Low-Permeability Gas Membrane, if installed, used and maintained in accordance with this Certificate, will meet or contribute to meeting the relevant requirements of the following Building Regulations (the presence of a UK map indicates that the subject is related to the Building Regulations in the region or regions of the UK depicted):

The Building Regulations 2010 (England and Wales) (as amended)

Requirement:	C1(2)	Site preparation and resistance to contaminants
Comment:		The product can contribute to a structure satisfying this Requirement. See sections 7.1 and 7.2 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 6.1 and 6.2 of this Certificate.
Regulation:	7	Materials and workmanship
Comment:		The product is acceptable. See section 11.1 and the *Installation* part of this Certificate.

The Building (Scotland) Regulations 2004 (as amended)

Regulation:	8(1)	Fitness and durability of materials and workmanship
Comment:		The product can contribute to a construction satisfying this Regulation. See section 11.1 and the *Installation* part of this Certificate.
Regulation:	9	Building standards applicable to construction
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[(1)(2)], 3.1.6[(1)(2)], 3.1.7[(1)(2)], 3.1.8[(1)(2)], 3.2.1[(2)] and 3.2.2[(1)(2)]. See sections 7.1 and 7.2 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[(1)(2)], 3.4.4[(1)(2)] and 3.4.6[(1)(2)]. See sections 6.1 and 6.2 of this Certificate.
Standard:	7.1(a)	Statement of sustainability
Comment:		The product can contribute to meeting the relevant requirements of Regulation 9, Standards 1 to 6, and, therefore, will contribute to a construction meeting a bronze level of sustainability as defined in this Standard.
Regulation:	12	Building standards applicable to conversions
Comment:		Comments made in relation to the product under Regulation 9, Standards 1 to 6, 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).

The Building Regulations (Northern Ireland) 2012

Regulation:	23(a)(i)(iii)(b)(i)	Fitness of materials and workmanship
Comment:		The product is acceptable. See section 11.1 and the *Installation* part of this Certificate.
Regulation:	26	Site preparation and resistance to contaminants
Comment:		The product can contribute to a structure satisfying the requirements of this Regulation. See sections 7.1 and 7.2 of this Certificate.
Regulation:	28(a)	Resistance to 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 6.1 and 6.2 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* (1.2) of this Certificate.

Additional Information

NHBC Standards 2013

NHBC accepts the use of the Visqueen Low-Permeability Gas Membrane, provided it is installed, used and maintained 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.*

The Visqueen Low-Permeability Gas Membrane (0.5 mm) is suitable for use in NHBC Amber 2 situations. See *Guidance on Evaluation of Development proposal on sites where Methane & Carbon Dioxide are present 2007* (section 14.2 and Annex E).

CE marking

The Certificate holder has taken the responsibility of CE marking the product in accordance with harmonised European Standard BS EN 13967 : 2012. An asterisk (*) appearing in this Certificate indicates that data shown are given in the manufacturer's Declaration of Performance.

Technical Specification

1 Description

1.1 Visqueen Low-Permeability Gas Membrane is a co-polymer thermoplastic membrane containing low-density polyethylene. The product is yellow in colour.

1.2 The membrane has the following nominal characteristics given in Table 1:

Table 1 Nominal Characteristics

Thickness* (mm)	0.5
Length* (m)	12.5
Width* (m)	4
Mass* ($g \cdot m^{-2}$)	460
Tensile strength* ($N \cdot mm^{-2}$)	
MD	20
CD	20
Elongation*(%)	
MD	675
CD	665
Nail tear resistance*(N)	
MD	333
CD	335
Resistance to static loading* (kg)	20
Watertightness* (2 kPa)	PASS
Durability (artificial ageing)*	PASS
Durability against chemicals*	PASS
Water vapour transmission ($M \cdot Ns \cdot g^{-1}$)	2100
Methane permeability ($m^2 \cdot s^{-1} \cdot Pa^{-1}$)	1.563×10^{-17}
Carbon dioxide permeability ($m^2 \cdot s^{-1} \cdot Pa^{-1}$)	1.473×10^{-17}
Radon permeability ($m^2 \cdot s^{-1}$)	5.477×10^{-17}

1.3 Products for use with the membrane include:

- Visqueen Double-sided Tape — a butyl double-sided tape for joints and laps
- Visqueen Gas Resistant Foil Tape — a single-sided jointing tape, suitable for securing laps and joints
- Visqueen Pre-formed Top Hat Units — for sealing around service pipe penetrations
- Visqueen Gas Resistant (GR) Lap Tape — a single-sided jointing tape suitable for securing laps.

1.4 Ancillary products available for use with the membrane but outside the scope of this Certificate are:

- TreadGUARD^{1500} — a 100% recycled, heavy-duty protection layer preventing damage to the membrane
- TreadGUARD^{300} — a medium-duty protection blanket preventing damage to the membrane
- Visqueen Detailing Strip — used for sealing around column penetrations and for repairs/patching of membranes damaged during installation
- Visqueen Gas Resistant Damp Proof Course — high-performance damp-proof course with low permeability to radon, carbon dioxide and methane gas
- Visqueen Zedex CPT DPC — a high-performance flexible dpc and cavity tray

- Visqueen GR SAM — aluminium/polyethylene laminate with a modified bitumen adhesive backing. Used to maintain gas membrane continuity on vertical surfaces and around complex penetrations and foundations
- Visqueen Gas Vent Mat — a 25 mm thick vent mat that forms a void to collect and transmit water and/or gas into adjacent drainage outlets or collector pipes
- Visqueen Liquid Gas Membrane — a grey, one-part, elastomeric polymer-modified liquid that dries to form a black, flexible membrane
- Visqueen Zedex High Bond DPC — a gas-resistant bitumen based damp-proof course.

2 Manufacture

2.1 The product is manufactured by extrusion.

2.2 As part of the assessment and ongoing surveillance of product quality, the BBA has:

- agreed with the manufacturer the quality control procedures and product testing to be undertaken
- assessed and agreed the quality control operated over batches of incoming materials
- monitored the production process and verified that it is in accordance with the documented process
- evaluated the process for management of nonconformities
- checked that equipment has been properly tested and calibrated
- undertaken to carry out the above measures on a regular basis through a surveillance process to verify that the specifications and quality control operated by the manufacturer are being maintained.

2.3 The management system of Visqueen Building Products has been assessed and registered as meeting the requirements of BS EN ISO 9001 : 2008 by Knight International (Certificate 4562).

3 Delivery and site handling

3.1 The product is delivered to site in rolls wrapped in branded polythene film, marked with a label bearing the product name, width, length and Certificate holder's address and phone number. The BBA logo and Certificate number are printed on the wrapper.

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

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on the Visqueen Low-Permeability Gas Membrane.

Design Considerations

4 Use

4.1 The Visqueen Low-Permeability Gas Membrane is satisfactory for use as a gas-resistant barrier to restrict the ingress of radon, methane and carbon dioxide gases into buildings from landfill and naturally occurring sources above or below the ground floor slab.

4.2 The membrane can be installed in the flooring constructions described in BRE Report 211 (BR 211 : 2007) which include:

- reinforced cast in-situ (ground-supported) concrete floors
- suspended beam-and-block concrete floors
- precast concrete slabs.

4.3 Buildings in areas of risk from landfill gas should be constructed in accordance with the recommendations of BS 8485 : 2007, the *Ground Gas Handbook*, 2009 and:

- BRE Report 211 (BR 211 : 2007) *Radon : Guidance on protective measures for new buildings*
- BRE Report 212 (BR 212 : 1991) *Construction of new buildings on gas contaminated land*
- BRE Report 376 (BR 376 : 1999) *Radon : guidance of protective measures for new dwellings in Scotland*
- BRE Report 413 (BR 413 : 2001) *Radon : guidance on protective measures for new dwellings in Northern Ireland*
- BRE Report 414 (BR 414 : 2001) *Protective measures for housing on gas-contaminated land*
- BRE Good Building Guide 73 : 2008 *Radon protection for new domestic extensions and conservatories with solid concrete ground floors*
- BRE Good Building Guide 74 : 2008 *Radon protection for new dwellings. Avoiding problems and getting it right!*
- BRE Good Building Guide 75 : 2009 *Radon protection for new large buildings.*

4.4 The product is also satisfactory for use as damp-proof membranes in accordance with CP 102 : 1973, Section 2 and BS 8000-4 : 1989.

5 Practicability of installation

The membrane is designed to be installed by a competent general builder, or a contractor, experienced with this type of product.

6 Resistance to water and water vapour

6.1 The membrane, including joints, provide an effective barrier to the passage of liquid moisture from the ground.

6.2 When installed in accordance with the following documents, the membrane will comply with the minimum sheet thickness detailed in the national Building Regulations:

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

Scotland — Mandatory Standard 3.4, clauses 3.4.2, 3.4.4 and 3.4.6

Northern Ireland — Regulation 28(a).

6.3 The membrane is impervious to water and provides a waterproof layer capable of accepting minor structural movements without damage in situations where it is not subject to hydrostatic pressure.

7 Resistance to underground gases

7.1 The product 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.

7.2 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, the product meets the criteria.

7.3 When installed in accordance with BRE Report 414, the membrane will be compliant with the recommendations made in CIRIA C665 : 2007 *Assessing risks posed by hazardous ground gases to building*, BS 8485 : 2007, BRE Report 211 and *NHBC Standards*. Guidance is given in the *Ground Gas Handbook*, 2009 and the Certificate holder's technical literature.

8 Resistance to puncture

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

8.2 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.

8.3 Depending on the type of construction, TreadGUARD^{1500} or TreadGUARD^{300} may be used to minimise the risk of puncture to the membrane.

9 Underfloor heating

There will be no adverse effect on the membrane from underfloor heating under normal operating conditions. The Certificate holder's advice should also be sought.

10 Maintenance

As the product is confined under concrete and have suitable durability (see section 11), maintenance is not required. However, any damage occurring before enclosure must be repaired (see section 15).

11 Durability

11.1 Results of 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.

11.1 Long periods of exposure to ultraviolet light will reduce the effectiveness of the membrane.

12 Reuse and recyclability

The product comprises polyethylene which can be recycled.

Installation

13 General

13.1 The Visqueen Low-Permeability Gas 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.

13.2 The membrane can be installed in all normal site conditions, provided that the air temperature is not below 5°C to prevent the risk of surface condensation.

13.3 Unless the base is smooth, a surface blinding of soft sand (or similar material) should be used to prevent puncturing during installation or when concrete screed is being placed.

13.4 If the membrane is installed below a steel-reinforced floor or concrete slab, it should be covered with a screed or Visqueen TreadGUARD^{1500} or TreadGUARD^{300} prior to the positioning of the reinforcement.

13.5 If the membrane is above the slab, its installation should be delayed until just before laying the screed or flooring top to avoid damage from site traffic.

14 Procedure

14.1 The product is applied to surfaces that have a smooth finish, ie they should be free from voids, projections and mortar deposits. Surfaces must be dry and free from dust and frost.

14.2 The membrane is are rolled out, ensuring that it is properly aligned. All end and side overlaps must be a minimum of 150 mm and prepared in accordance with the Certificate holder's instructions.

14.3 All joints must be bonded with Visqueen Doubled Sided Tape. Joints are secured with Visqueen Gas Resistant Foil Tape or Visqueen Gas Resistant (GR) Lap Tape.

14.4 The surface of the gas membrane (dpm) to be lapped must be dry and dust-free. When using Visqueen Double-sided Tape, the joints are pressed down and well rolled. Alternatively joints can be hot-air welded.

14.5 All service penetrations and direction changes must be properly detailed. Visqueen Pre-formed Top Hat Units are available for sealing around pipe entries.

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

14.7 The membrane must be covered by a screed or other protective layer as soon as possible after installation.

14.8 The membrane installation may be subject to third-party independent validation in accordance with the *Ground Gas Handbook,* 2009.

15 Repair

Before permanent protection is placed, the membrane area must be inspected for defects. Damage to the product must be repaired using Visqueen Detailing Strip, or, if a larger repair is required, by using a patch of the membrane and sealing laps with Visqueen Double-sided Tape and Visqueen Gas Resistant Foil Tape. All patches must extend a minimum of 150 mm from the damaged area. If required by the local authority, repair work should be confirmed by an independent validation report, as all gas membrane installation should be subject to third-party validation in accordance with the *Ground Gas Handbook,* 2009.

Technical Investigations

16 Tests

An assessment was made of test data in relation to:

- mass per unit area
- density
- water vapour permeability
- water vapour resistance
- static indentation
- low-temperature flexibility
- dimensional stability
- watertightness
- heat ageing at 70°C for 84 days followed by tensile strength and elongation, nail tear resistance and watertightness
- short-term UV ageing, followed by tensile strength and elongation
- tensile strength of joints
- heat ageing of joints at 70° for 84 days followed by tensile strength.

17 Investigations

17.1 An evaluation was made of the results of the test data regarding permeability of radon, methane and carbon dioxide in relation to the product.

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

17.3 A site visit was conducted to assess practicability of installation.

Bibliography

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

BS 8485 : 2007 *Code of practice for the characterization and remediation from ground gas in affected areas*

BS EN ISO 9001 : 2008 *Quality management systems — Requirements*

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

BS EN 13967 : 2012 *Flexible sheets for waterproofing — Plastic and rubber damp-proof sheets including plastic and rubber basement tanking sheet — Definitions and Characteristics*

Conditions of Certification

18 Conditions

18.1 This Certificate:

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

18.2 Publications, documents, specifications, legislation, regulations, standards and the like referenced in this Certificate are those that were current and/or deemed relevant by the BBA at the date of issue or reissue of this Certificate.

18.3 This Certificate will remain valid for an unlimited period provided that the product/system and its manufacture and/or fabrication, including all related and relevant parts and 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.

18.4 The BBA has used due skill, care and diligence in preparing this Certificate, but no warranty is provided.

18.5 In issuing this Certificate, the BBA is not responsible and is excluded from any liability to any company, firm, organisation or person, for any matters arising directly or indirectly from:

- 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
- actual installations of the product/system, including their nature, design, methods, performance, workmanship and maintenance
- any works and constructions in which the product/system is installed, including their nature, design, methods, performance, workmanship and maintenance
- any loss or damage, including personal injury, howsoever caused by the product/system, including its manufacture, supply, installation, use, maintenance and removal
- any claims by the manufacturer relating to CE marking.

18.6 Any information relating to the manufacture, supply, installation, use, maintenance and removal 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, maintained and removed. It does not purport in any way to restate the requirements of the Health and Safety at Work etc. Act 1974, or of any other statutory, common law or other duty which may exist at the date of issue or reissue 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.

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