A Proctor Group
The Haugh
Blairgowrie
Perthshire PH10 7ER

Tel: 01250 872 261 Fax: 01250 872 727
e-mail: technical@proctorgroup.com
website: www.proctorgroup.com

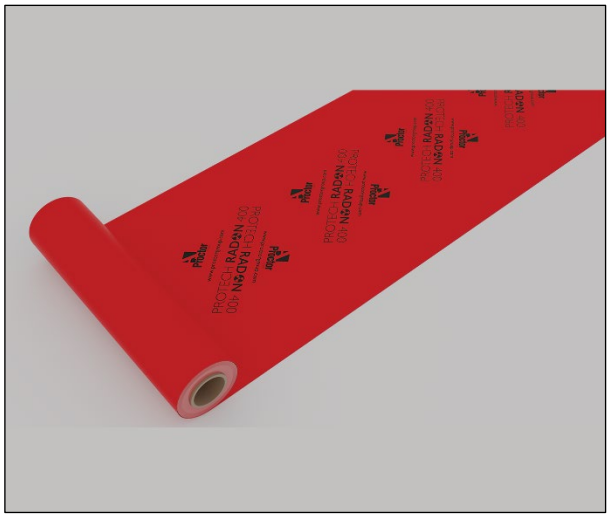
Agrément Certificate
11/4868
Product Sheet 3

PROTECH GAS RESISTANT MEMBRANES

PROTECH RADON 400

This Agrément Certificate Product Sheet(1) relates to Protech Radon 400, a low-density polyethylene (LDPE) gas barrier and damp-proof membrane for use in concrete ground floors, above or below slabs not subject to hydrostatic pressure, to protect the building against moisture and radon 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 resisting the ingress of radon into a building (see section 7).

Resistance to mechanical damage — the membrane will accept, without damage, the limited foot traffic and loads associated with installation and the effects of thermal and other minor movement likely to occur in practice (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 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

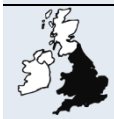
Date of First issue: 27 April 2022

Hardy Giesler
Chief Executive Officer

British Board of Agrément
Bucknalls Lane
Watford
Herts WD25 9BA
©2022
tel: 01923 665300
clientservices@bbacerts.co.uk
www.bbacerts.co.uk

Regulations

In the opinion of the BBA, Protech Radon 400, if installed, used and maintained in accordance with this Certificate, can satisfy or contribute to satisfying 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:		When properly installed in a correctly designed structure, the membrane forms an effective barrier to radon and can contribute to satisfying this Requirement. See section 7.1 of this Certificate.
Requirement:	**C2(a)**	**Resistance to moisture**
Comment:		When properly installed in a correctly designed structure, the membrane forms an effective barrier to the movement of water within the ground-floor slab, enabling compliance with this Requirement. See section 6 of this Certificate.
Regulation:	**7(1)**	**Materials and workmanship**
Comment:		The membrane is an acceptable material. See section 11 and the *Installation* part of this Certificate.

The Building (Scotland) Regulations 2004 (as amended)

Regulation:	**8(1)**	**Durability, workmanship and fitness of materials**
Comment:		The membrane can contribute to a construction satisfying this Regulation. See section 11 and the *Installation* part of this Certificate.
Regulation:	**9**	**Building standards applicable to construction**
Standard:	3.1	Site preparation – harmful and dangerous substances
	3.2	Site preparation – protection from radon gas
Comment:		The membrane will contribute to satisfying 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 section 7.1 of this Certificate.
Standard:	3.4	Moisture from the ground
Comment:		When properly installed in a correctly designed structure, the membrane 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 section 6 of this Certificate.
Standard:	7.1(a)	Statement of sustainability
Comment:		The product can contribute to satisfying 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 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 (as amended)

Regulation:	**23(a)(i)**	**Fitness of materials and workmanship**
Comment:	**(iii)(b)(i)**	The product is acceptable. See section 11 and the *Installation* part of this Certificate.

Regulation:	**26**	**Site preparation and resistance to contaminants**
Comment:		When properly installed in a correctly designed structure, the membrane forms an effective barrier to radon and can contribute to satisfying this Regulation. See section 7.1 of this Certificate.
Regulation:	**28(a)**	**Resistance to moisture and weather**
Comment:		When properly installed in a correctly designed structure, the membrane forms an effective barrier to the movement of water within the ground-floor slab, enabling compliance with this Regulation. See section 6 of this Certificate.

Construction (Design and Management) Regulations 2015
Construction (Design and Management) Regulations (Northern Ireland) 2016

Information in this Certificate may assist the client, designer (including Principal Designer) and contractor (including Principal Contractor) to address their obligations under these Regulations.

See sections: 1 *Description* (1.2) and 14 *Procedure* (14.4) of this Certificate.

Additional Information

NHBC Standards 2022

In the opinion of the BBA, Protech Radon 400, if installed, used and maintained in accordance with this Certificate, can satisfy or contribute to satisfying the relevant requirements in relation to NHBC Standards, Chapters 4.1 *Land quality – managing ground conditions* and 5.1 *Substructure and ground bearing floors*.

CE marking

The Certificate holder has taken the responsibility of CE marking the product, in accordance with harmonised European Standard EN 13967 : 2012.

Technical Specification

1 Description

1.1 Protech Radon 400 is a LDPE membrane incorporating a polyester scrim reinforcement. The membrane is red in colour.

1.2 The membrane has the following nominal characteristics:

Effective thickness (mm)	0.4 (measured between the reinforcement scrim)
Roll length (m)	50
Roll width (m)	2
Mass per unit area ($g \cdot m^{-2}$)	400
Tensile strength ($N \cdot 50\ mm^{-1}$)	
Machine direction	≥310
Cross direction	≥210
Nail tear strength (N)	
Machine direction	≥200
Cross direction	≥230
Watertightness (2 kPa)	Pass.

1.3 Ancillary products for use with the membrane include:

- Protech GM Double-Sided Tape — a cross-linked butyl sealing and bonding tape
- Protech GM Flashing Strip — a foil tape used for sealing around column penetrations and for repairs/patching of membranes damaged during installation.

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

- Protech GM 3 mm Protection Board — a board for protecting the membrane from mechanical damage and puncture from backfilling
- Protech GM Protection Fleece — a fleece for protecting the membrane from mechanical damage and puncture from backfilling
- Protech Radon 400 Starterband — perimeter edging strip
- Protech GM Tophats — preformed top hat sections for sealing around pipe penetrations in the gas membrane
- Protech SAGM (Self Adhesive Gas Membrane) — aluminium/polyethylene laminate with a modified bitumen adhesive backing, used to maintain gas membrane continuity on vertical surfaces and around complex penetrations and foundations
- Protech Radon 400 Corner Units — preformed internal and external sections for detailing of the membrane at perimeter corners, in accordance with BS 8215 : 1991
- Protech GM Primer — for preparing substrates prior to the application of Protech SAGM
- Radon sump system
- compatible proprietary gas resistant damp-proof course (dpc).

2 Manufacture

2.1 The membrane is manufactured by an extrusion/coating process.

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 the manufacturer has been assessed and registered as meeting the requirements of ISO 9001 : 2015 by Veritas Certification, Belgium (Certificate BE011118).

3 Delivery and site handling

3.1 The product is delivered to site in rolls. Each roll has a leaflet enclosed that includes a description of the product and brief installation details. The BBA logo and Certificate number are printed on the leaflet and pallet label.

3.2 The rolls must be stacked on a flat surface, kept under cover and protected from sunlight and from physical damage.

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on Protech Radon 400.

Design Considerations

4 Use

4.1 Protech Radon 400 is satisfactory for use as a gas-resistant barrier to restrict the ingress of radon into buildings from naturally occurring sources.

4.2 Buildings in areas of risk should be constructed in accordance with the recommendations of BRE Report BR 211 : 2015.

4.3 The membrane is also satisfactory for use as a damp-proof membrane (dpm) in accordance with CP 102 : 1973 Section 3, BS 8000-0 : 2014 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, provides an effective barrier to the passage of liquid moisture from the ground.

6.2 The membrane will comply with the minimum sheet thickness detailed in the documents supporting the national Building Regulations.

7 Resistance to underground gases

7.1 The membrane will restrict the ingress of radon into buildings from naturally occurring sources.

7.2 Measured gas permeability/diffusion values on an unjointed and jointed membrane are given in Table 1.

Table 1 Radon gas transmittance of Protech Radon 400

Gas	Method	Result ($m \cdot s^{-1}$)(1)
Protech Radon 400 membrane (unjointed)	SP Method 3873	1.8×10^{-8}

(1) Weight of membrane tested was 350 $g \cdot m^{-2}$.

7.3 In the opinion of the BBA, the membrane satisfies the criteria for a radon gas-resistant membrane of BRE Report BR 211 : 2015.

8 Resistance to mechanical damage

8.1 When installed, the membrane is capable of accommodating the minor movement likely to occur under normal service conditions.

8.2 The product can be punctured by sharp objects and care must therefore be taken in handling building materials and equipment over the exposed surface.

8.3 The product will not be damaged by normal foot traffic provided there are no sharp objects present on the membrane surface prior to and during installation of the protective layer.

9 Underfloor heating

There will be no adverse effect on the membrane from underfloor heating under normal service conditions. In other circumstances, the Certificate holder's advice should be sought.

10 Maintenance

As the membrane is confined under concrete and has 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 The membrane will, in normal circumstances, remain effective against the ingress of water and water vapour, and will restrict the ingress of radon during the lifetime of the building.

11.2 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 Protech Radon 400 must be installed and fixed in accordance with the Certificate holder's instructions and the relevant clauses of CP 102 : 1973 Section 3, BS 8000-0 : 2014 and BS 8000-4 : 1989, BRE Report BR 211 : 2015 and this Certificate.

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 suitable protection prior to the positioning of the reinforcement. The Certificate holder should be consulted for suitable protection products.

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

14 Procedure

14.1 The product 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.

14.2 Concrete surfaces should be dense. Vertical surfaces of brickwork and blockwork should be dry and rendered to provide an even surface. Brickwork or unrendered blockwork must be flush pointed to give a smooth surface without sudden changes in level.

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

14.4 Joints are bonded with Protech GM Double-Sided Tape. The joints should be pressed down with a long-handled roller to ensure that the tape is well adhered. Alternatively, joints can be made by hot-air welding.

14.5 The surfaces of the membrane to be jointed must be dry and dust-free.

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

14.7 When the membrane is to be laid below the concrete slab, it should be loose-laid to accommodate any small movement.

14.8 The continuity of the gas protection must extend over the footprint of the building and the gas membrane sealed to a suitable gas-resistant dpc.

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

14.10 The membrane installation should be subject to third-party independent validation in accordance with BS 8485 : 2015.

15 Repair

Before permanent protection is placed, the membrane area must be inspected for defects. Damage to the product must be repaired using Protech GM Flashing Strip or, if a larger repair is required, using a patch of the membrane, and the laps sealed with Protech GM Double-Sided 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 recommendations of BS 8485 : 2015.

Technical Investigations

16 Tests

16.1 Tests were carried out and the results assessed to determine:

- thickness
- mass per unit area.

16.2 Test data relating was reviewed to establish:

- tensile strength and elongation
- nail tear resistance
- water vapour permeability
- water vapour resistance
- watertightness
- resistance to static loading
- resistance to impact
- heat ageing followed by tensile strength and elongation, nail tear resistance and watertightness
- short-term UV ageing, followed by tensile strength and elongation.
- Radon gas transmittance.

17 Investigations

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

Bibliography

BS 8000-0 : 2014 *Workmanship on construction sites - Introduction and general principles*
BS 8000-4 : 1989 *Workmanship on building sites - Code of practice for waterproofing*

BS 8215 : 1991 *Code of practice for design and installation of damp-proof courses in masonry construction*

BS 8485 : 2015 + A1 : 2019 *Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings*

BRE Report BR 211 : 2015 *Radon: guidance on protective measures for new buildings*

CP 102 : 1973 *Protection of buildings against water from the ground*

EN 13967 : 2012 + A1 : 2017 *Flexible sheets for waterproofing - Plastic and rubber damp proof sheets including plastic and rubber basement tanking sheet - Definitions and characteristics*

ISO 9001 : 2015 *Quality management systems – Requirements*

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.