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BBA APPROVAL INSPECTION TESTING CERTIFICATION
TECHNICAL APPROVALS FOR CONSTRUCTION

Agrément Certificate
15/5251
Product Sheet 2

RADBAR DAMP-PROOF COURSES

RADBAR GAS RESISTANT DAMP-PROOF COURSE

This Agrément Certificate Product Sheet(1) relates to the Radbar Gas Resistant Damp-proof Course, for use in walls as a horizontal, vertical or stepped gas-resistant damp-proof course (including cavity trays), in either solid or cavity walls of brick, block, stone or concrete.

(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

Behaviour under load — the product will not extrude under load, and will not adversely affect the ability of a properly designed and built wall to sustain and transmit compression (see section 6).

Resistance to water and water vapour — the product will provide an effective barrier against liquid water and water vapour (see section 7).

Resistance to underground gases — the product will provide an effective barrier against radon, methane and carbon dioxide (see section 8).

Compatibility with other materials — within normal construction, the product is compatible with all materials with which it will be in contact (see section 9).

Durability — when properly specified and installed, the product, in normal circumstances, will remain effective during the lifetime of the building (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: 8 September 2015

John Albon — Head of Approvals
Construction Products

Claire Curtis-Thomas
Chief Executive

Certificate amended on 17 November 2015 to update product specification.

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

Regulations

In the opinion of the BBA, the Radbar Gas Resistant Damp-proof Course, 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:	A1	**Loading**
Comment:		The product will not extrude up to the point of failure of the wall, and will not adversely affect the ability of a properly designed and built wall to sustain and transmit horizontal and compression loads. See section 6 of this Certificate.
Requirement:	C1(2)	**Site preparation and resistance to contaminants**
Comment:		The product can contribute to a structure satisfying this Requirement. See sections 8.1 of this Certificate.
Requirement:	C2(a)(b)	**Resistance to weather and ground moisture**
Comment:		Properly installed in a correctly designed structure, the product forms an effective barrier to the movement of water within the wall, enabling compliance with this Requirement. See section 7 of this Certificate.
Regulation:	7	**Materials and workmanship**
Comment:		The product is acceptable. 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 use of the product satisfies the requirements of this Regulation. See section 11 and the *Installation* part of this Certificate.
Regulation:	9	**Building standards applicable to construction**
Standard:	1.1(a)(b)	Structure
Comment:		The product will not extrude up to the point of failure of the wall, and will not adversely affect the ability of a properly designed and built wall to sustain and transmit horizontal and compression loads, with reference to clauses 1.1.1[(1)(2)] and 3.10.1[(1)(2)]. See section 6 of this Certificate.
Standard:	3.1	Site preparation — harmful and dangerous substances
Standard:	3.2	Site preparation — protection from radon gas
Comment:		The product can contribute to satisfying the requirements of these Standards, with reference to clauses 3.1.6[(1)(2)], 3.2.1[(2)] and 3.2.2[(1)]. See section 8.1 of this Certificate.
Standard:	3.4	Moisture from the ground
Comment:		Properly installed in a correctly designed structure, the product will form an effective barrier to the movement of water within the wall. See section 7 of this Certificate.
Standard:	3.10	Precipitation
Comment:		Properly installed in a correctly designed structure, the product forms an effective barrier to the movement of water within the wall, enabling compliance with this Standard, with reference to clauses 0.12.1[(1)(2)] and 3.10.1[(1)(2)]. See section 7 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:		All comments given for 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)(iii)(b)(i)	**Fitness of materials and workmanship**
Comment:		The product is acceptable. See section 11 and the *Installation* part of this Certificate.
Regulation:	26	**Preparation of site and resistance to dangerous and harmful substances**
Comment:		The product can contribute to satisfying this Regulation. See section 8.1 of this Certificate.
Regulation:	28(a)	**Resistance to moisture and weather**
Comment:		Properly installed in a correctly designed structure, the product forms an effective barrier to the movement of water within the wall, enabling compliance with this Regulation. See section 7 of this Certificate.
Regulation:	30	**Stability**
Comment:		The product will not extrude up to the point of failure of the wall, and will not adversely affect the ability of a properly designed and built wall to sustain and transmit horizontal and compression loads. See section 6 of this Certificate.

Construction (Design and Management) Regulations 2015

Construction (Design and Management) Regulations (Northern Ireland) 2007

Information in this Certificate may assist the client, Principal Designer/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 2014

NHBC accepts the use of the Radbar Gas Resistant Damp-proof Course, provided it is installed, used and maintained in accordance with this Certificate, in relation to *NHBC Standards*, Chapter 6.1 *External masonry walls.*

CE marking

The Certificate holder has taken the responsibility of CE marking the product, in accordance with harmonised European Standard BS EN 14909 : 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 The Radbar Gas Resistant Damp-proof Course (DPC) is a flexible sheet comprising a mixture of thermoplastic polymers and other additives, extruded into a sheet form with an embossed surface to assist mortar adhesion. The product is available in black and grey.

1.2 The rolls are manufactured to the dimensions and nominal characteristics given below:

Thickness* (mm)	0.8
Roll width*(mm)	100 to 1200
Roll length*(m)	20
Mass per unit area* ($g \cdot m^{-2}$)	770
Resistance to tearing* (N)	725
Watertightness* (2 kPa)	Pass
Durability (artificial ageing)*	Pass
Durability (alkali resistance)*	Pass
Resistance to low temperature (°C)	–20.

1.3 Ancillary items used with the product are:

- Radbar double sided tape — for sealing joints
- Radbar preformed cloaks — flexible units for angles in stepped or horizontal damp-proof coursing.

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 Capital Valley Plastics Ltd has been assessed and registered as meeting the requirements of BS EN ISO 9001 : 2008 by NQA (Certificate 6643).

3 Delivery and site handling

3.1 The product is delivered to site in rolls secured with a paper or polythene wrapper bearing the product name, roll dimensions, BBA logo and CE marking information.

3.2 Rolls must be stored on end and under cover. Contact with organic solvents must be avoided.

3.3 If the product is stored at low temperatures, it should be left in a warm place before use to improve handling.

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on the Radbar Gas Resistant Damp-proof Course.

Design Considerations

4 Use

4.1 The Radbar Gas Resistant Damp-proof Course, when correctly specified and installed in accordance with this Certificate, is satisfactory for use as a horizontal or stepped damp-proof course (including cavity trays) in either solid or cavity walls of brick, stone or concrete. General standards of good design practice are given in BS EN 1996-1-1 : 2005, BS EN 1996-1-2 : 2005, BS EN 1996-2 : 2006, BS EN 1996-3 : 2006 and their respective UK Annexes, BS 8215 : 1991 and PD 6697 : 2010.

4.2 The product must be used in conjunction with a gas-resistant membrane to restrict the ingress of gas into buildings. The Certificate holder must be consulted for suitable products and recommended detailing practices.

5 Practicability of installation

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

6 Behaviour under load

6.1 The product will not extrude under load, up to the point of compressive failure of the wall, and will not adversely affect the ability of a properly-designed and built wall to sustain and transmit compression load. Creep tests carried out to DD 86-2 : 1984 give a deformation result of 0.048 mm[1].

6.2 The stability of a wall in respect of lateral loads must be checked in relation to the stresses permitted between the DPC and the mortar. A wall incorporating the product must be designed and built in accordance with BS EN 1996-1-1 : 2005.

6.3 The product will withstand movement of the wall, and is unlikely to be impaired by normally occurring movements up to the point where the wall itself is deemed to have failed.

6.4 The presence of a DPC can reduce the shear and tensile (therefore, bending) strengths of a wall at that point and design of the structure should take account of this. Shear tests carried out to BS EN 1052-4 : 2000 gave characteristics shears strengths as detailed in Table 1. The characteristic flexural strength as tested to DD 86-1 : 1983 is given as 0.04 $N \cdot mm^{-2}$.

Table 1 Characteristic shear strength of Radbar High Performance Damp-proof Course

Pre-compression ($N \cdot mm^{-2}$)	Characteristic shear strength ($N \cdot mm^{-2}$)
0.2	0.14
0.6	0.34
1.0	0.52

7 Resistance to water and water vapour

The product, when correctly specified and installed, will provide an effective barrier against liquid water and water vapour either from a source external to the structure, or from one part of a structure to another.

8 Resistance to underground gases

8.1 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.

8.2 Buildings in areas of risk from underground gases 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*. Guidance is given in the *Ground Gas Handbook 2009* and the Certificate holder's technical literature.

9 Compatibility with other materials

Under normal circumstances, the product is compatible with other materials with which it is likely to be in contact in normal construction.

10 Maintenance

As the product is confined within the wall and wall cavity and has suitable durability (see section 11), maintenance is not required.

11 Durability

When properly specified and installed, the product, in normal circumstances, will remain effective for the lifetime of the building.

Installation

12 General

12.1 Installation of the Radbar Gas Resistant Damp-proof Course must follow normal good practice for the detailing of damp-proof courses, as set out in PD 6697 : 2010, and must be in accordance with the relevant clauses of BS 8000-3 : 2001, BS 8215 : 1991, BRE Digest 380 *Damp-proof courses*, and the Certificate holder's instructions.

12.2 Buildings in areas of risk from underground gases should be designed and constructed in accordance with BRE Report BR 211 (BR 376 in Scotland and BR 413 in Northern Ireland), BR 414 and the recommendations laid out in BR 212.

12.3 Particular care should be taken to ensure that the product is incorporated into the building as part of a complete system to prevent the ingress or build-up of contaminants; this may require the use of additional methods such as sumps and ventilation.

12.4 As with all flexible damp-proof courses, care should be taken to avoid impact damage from sharp objects (eg chisels) during installation.

12.5 The product is handled in the same manner as that for conventional flexible damp-proof courses, and is cut with a sharp knife. It will remain sufficiently flexible for installation in low temperatures and will not become tacky in warm conditions.

13 Procedure

13.1 The product must be laid on a wet, even bed of mortar and extend through the full thickness of the wall or wall leaf, including pointing, applied rendering or other facing material.

13.2 Perforations in adjacent courses of brickwork must be completely filled with mortar.

13.3 All lap joints in the DPC must have a minimum 150 mm overlap, be completely sealed with Radbar double-sided tape and be supported by a suitable joint system in accordance with the Certificate holder's instructions.

13.4 All surfaces to be joined must be clean and dry. The release paper protecting the tape should not be removed until the joint is ready to be formed. The tape should not be left exposed.

13.5 Certain details are difficult to form with the DPC, particularly when bending the material through two angles at the same time. In such cases, care must be taken to achieve a satisfactory seal and, where necessary, Radbar preformed cloaks used.

13.6 When using the product with boot lintels or similar constructions, it is installed to follow the lintel profile wherever possible.

13.7 As with other similar materials, care must be taken to avoid damaging the DPC during cleaning of mortar droppings. Recommendations for avoiding damage occurring are:

- use of cavity battens to prevent mortar droppings from reaching the DPC
- removal of mortar droppings before they harden
- avoidance of use of implements such as steel rods for cleaning
- examination of the DPC for damage as work proceeds.

Beam and block flooring

13.8 When used with beam and block flooring, the DPC may be laid dry on a brick or block wall provided that:

- minimum bearing(1) of the beam is achieved
- dead and imposed loads upon the DPC via the beam do not exceed 2.5 $N \cdot mm^{-2}$
- the surface of the wall onto which the DPC and beam are to be installed is clean, smooth and free from projections or perforations. If this cannot be achieved, the DPC should be laid in an even bed of mortar
- loose aggregate is swept from the wall prior to installation of the DPC, and from the DPC prior to installation of the beams.

(1) As recommended by the flooring manufacturer.

14 Repair

Damaged areas of the product can be repaired prior to installation by cutting and/or replacing the damaged section, ensuring joints are made in accordance with section 13. Once covered, the product cannot be repaired.

Technical Investigations

15 Tests

15.1 Tests were conducted in accordance with BS EN 14909 : 2012 to determine:

- visible defects
- dimensions
- mass per unit area
- watertightness
- heat ageing followed by watertightness
- exposure to alkali followed by watertightness
- water vapour transmission
- resistance to impact
- resistance to low temperature
- resistance to tearing (nail shank)
- joint strength
- resistance to static loading.

15.2 Other tests were carried out to determine:

- tensile strength and elongation
- dimensional stability
- chisel impact
- shear and flexural strength
- creep.

16 Investigations

16.1 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.

16.2 An evaluation was made of the results of test data regarding permeability of radon, methane and carbon dioxide.

Bibliography

BS 8000-3 : 2001 *Workmanship on building sites — Code of practice for masonry*

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

BS EN 1052-4 : 2000 *Methods of test for masonry — Determination of shear strength including damp proof course*

BS EN 1996-1-1 : 2005 *Eurocode 6 : Design of masonry structures — General rules for reinforced and unreinforced masonry structures*
NA to BS EN 1996-1-1 : 2005 UK National Annex to *Eurocode 6 : Design of masonry structures — General rules for reinforced and unreinforced masonry structures*
BS EN 1996-1-2 : 2005 *Eurocode 6 — Design of masonry structures — General rules — Structural fire design*
NA to BS EN 1996-1-2 : 2005 UK National Annex to *Eurocode 6 — Design of masonry structures — General rules — Structural fire design*
BS EN 1996-2 : 2006 *Eurocode 6 : Design of masonry structures — Design considerations, selection of materials and execution of masonry*
NA to BS EN 1996-2 : 2006 UK National Annex to *Eurocode 6 : Design of masonry structures — Design considerations, selection of materials and execution of masonry*
BS EN 1996-3 : 2006 *Eurocode 6 : Design of masonry structures : Simplified calculation methods for unreinforced masonry structures*
NA to BS EN 1996-3 : 2006 UK National Annex to *Eurocode 6 : Design of masonry structures : Simplified calculation methods for unreinforced masonry structures*

BS EN 14909 : 2012 *Flexible sheets for waterproofing — Plastic and rubber damp-proof courses — Definitions and characteristics*

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

DD 86-1 : 1983 *Damp-proof courses — Methods of test for flexural bond strength and short term shear strength*

DD 86-2 : 1984 *Damp-proof courses — Method of test for creep deformation*

PD 6697 : 2010 *Recommendations for the design of masonry structures to BS EN 1996-1-1 and BS EN 1996-2*

17 Conditions

17.1 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.

17.2 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.

17.3 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.

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

17.5 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.

17.6 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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