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Agrément Certificate
97/3325
Product Sheet 10

GRACE CONSTRUCTION STRUCTURAL WATERPROOFING MEMBRANES

PREPRUFE 160R PLUS

This Agrément Certificate Product Sheet⁽¹⁾ relates to Preprufe 160R Plus, a pre-applied damp-proof and waterproof membrane for use in external tanking of below ground structures. The product is also used to protect the building against radon, methane and carbon dioxide gases 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

Weathertightness — the membrane will resist the passage of liquid water and moisture into the building (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 mechanical damage — the membrane will accept, without damage, the limited foot traffic and loads associated with installation (see section 8).

Adhesion and stability — the adhesion of the membrane to reinforced concrete and to itself is satisfactory (see section 9).

Durability — under normal service conditions the membrane will provide an effective barrier to the transmission of liquid water and water vapour, and will restrict the ingress of radon, methane and carbon dioxide gases during the lifetime of the structure in which it is installed (see section 12).

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

A handwritten signature in black ink, appearing to read 'Simon Wroe'.

Simon Wroe
Head of Approvals — Materials

A handwritten signature in black ink, appearing to read 'Claire Curtis-Thomas'.

Claire Curtis-Thomas
Chief Executive

Date of First issue: 10 December 2013

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, Preprufe 160R Plus, 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 membrane can contribute to a structure satisfying this Requirement. See section 7 of this Certificate.
Requirement: C2(a)	Resistance to moisture
Comment:	Tests indicate that the membrane will enable a structure to satisfy this Requirement. See section 6.1 of this Certificate.
Regulation: 7	Materials and workmanship
Comment:	The membrane is acceptable. See section 12 and the <i>Installation</i> part of this Certificate.



The Building (Scotland) Regulations 2004 (as amended)

Regulation: 8(1)	Fitness and durability of materials and workmanship
Comment:	The membrane can contribute to a construction meeting this Regulation. See section 12 and the <i>Installation</i> 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 membrane forms an effective barrier to the movement of radon, carbon dioxide and methane gases within the ground 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 ⁽¹⁾⁽²⁾ and 3.2.2 ⁽¹⁾⁽²⁾ . See section 7 of this Certificate.
Standard: 3.4	Moisture from the ground
Comment:	Tests indicate that the membrane will enable a structure to satisfy the requirements of this Standard, with reference to clauses 3.4.2 ⁽¹⁾⁽²⁾ , 3.4.4 ⁽¹⁾⁽²⁾ and 3.4.6 ⁽¹⁾⁽²⁾ . See section 6.1 of this Certificate.
Standard: 7.1(a)	Statement of sustainability
Comment:	The membrane 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 this membrane 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)(iv)(b)(i)	Fitness of materials and workmanship
Comment:	The membrane is acceptable. See section 12 and the <i>Installation</i> part of this Certificate.
Regulation: 26(a)	Preparation of site and resistance to dangerous and harmful substances
Comment:	The membrane can contribute to a structure satisfying the requirements of this Regulation. See section 7 of this Certificate.
Regulation: 28(a)	Resistance to moisture and weather
Comment:	Tests indicate that the membrane will enable a structure to satisfy the requirements of this Regulation. See section 6.1 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 sections: 1 *Description* (1.3) and 3 *Delivery and site handling* (3.3) of this Certificate.

Additional Information

NHBC Standards 2013

NHBC accepts the use of Preprufe 160R Plus, 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*, clause M10 *Tanking materials*.

CE marking

The Certificate holder has taken the responsibility of CE marking the product in accordance with harmonised European Standard EN 13967 : 2007. 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 Preprufe 160R Plus is a white PE-HD film with a pressure-sensitive adhesive protected by a traffickable weather-resistant coating with dual ziplaps for added adhesion.

1.2 Preprufe Tape is available for use in overbanding end laps and cut edges for detailing. An LT grade is available for low-temperature applications and an HC grade is available for use in hot climates.

1.3 The nominal characteristics of the product are:

*Thickness (mm)	0.8
*Width (m)	1.17
*Roll length (m)	36.5
*Roll weight (kg)	42
*Mass per unit area ($\text{kg}\cdot\text{m}^{-2}$)	0.8
*Watertightness (60 kPa)	Pass
*Tensile strength (N per 6 mm)	60 (longitudinal) and 60 (transverse)
*Elongation (%)	4.5 (longitudinal) and 4 (transverse)
*Nail tear strength (N)	300 (longitudinal) and 450 (transverse)
*Compatibility with bitumen	Pass
Radon diffusion coefficient ($\text{m}^2\cdot\text{s}^{-1}$)	5.6×10^{-12}
Methane resistance ($\text{ml}\cdot\text{m}^{-2}\cdot\text{day}^{-1}\cdot\text{atm}^{-1}$)	60.81
Carbon dioxide resistance ($\text{ml}\cdot\text{m}^{-2}\cdot\text{day}^{-1}\cdot\text{atm}^{-1}$)	3.2

1.4 The nominal characteristics of the Preprufe Tape are:

- Thickness (mm) 0.7
- Width (m) 0.1
- Roll length (m) 15
- Roll weight (kg) 2
- Mass per unit area ($\text{kg}\cdot\text{m}^{-2}$) 1.33

1.4 Ancillary items for use with the product but outside the scope of this Certificate are:

- Bituthene LM — a liquid-applied compound for sealing around penetrations and irregular surfaces
- Adcor 500S — a hydro-expansive waterstop for concrete construction joints
- Adcor 550HI — a hydro-expansive injectable waterstop for added security of concrete construction joints.

2 Manufacture

2.1 Preprufe 160R Plus is manufactured by a compound mixing and coating process. The adhesive compound is blended and applied onto the release liner using an extrusion die and then laminated with PE-HD film.

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, W R Grace & Co., has been assessed and registered as meeting the requirements of BS EN ISO 9001 : 2008 by Intertek (Certificate QMS-0816).

3 Delivery and site handling

3.1 Rolls of the membrane are packed with application instructions in polythene wrappers and cardboard containers marked with the roll batch number, and bear the Certificate holder's name and the BBA logo incorporating the number of this Certificate.

3.2 Rolls must be suitably stored to prevent damage, under cover and in a cool, dry area.

3.3 Bituthene LM is delivered to site in 5.7 litre packs. The product is classified under *The Chemicals (Hazard Information and Packaging for Supply) Regulations 2009 (CHIP4)/Classification, Labelling and Packaging of Substances and Mixtures (CLP Regulation) 2009* and bears the appropriate hazard warning label. The flashpoint and hazard classification are given in Table 1.

Table 1 Flashpoint and hazard classification

Component	Flashpoint °C	Classification
Bituthene LM	>100	Toxic, Harmful

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on Preprufe 160R Plus.

Design Considerations

4 Use

4.1 Preprufe 160R Plus is satisfactory for use as waterproofing and damp-proofing in grades 1, 2 and 3 basement constructions as defined in of BS 8102 : 2009, Table 1.

4.2 The membrane is satisfactory for use to restrict the ingress of radon, methane and carbon dioxide gases into buildings from landfill and naturally occurring sources.

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


- BRE Report 211 (BR 211 : 2007) *Radon : guidance on protective measures for new dwellings*
- 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 of 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 membrane is white in colour to reduce solar gain after installation prior to pouring of the concrete.

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 Weathertightness

 6.1 Results of tests confirm that the membrane and joints in the membrane, when completely sealed and consolidated, will adequately resist the passage of moisture from the ground and so meet the relevant requirements of the national Building Regulations:


England and Wales — Approved Document C, Requirement C1(2), Section 4.7, and Requirement C2(a), Section 6

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

Northern Ireland —Regulation 28(a).

6.2 The membrane is impervious to water and will give a waterproof layer capable of accepting minor structural movement without damage.

7 Resistance to underground gases

 7.1 The 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.

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 membrane meets the criteria.

8 Resistance to mechanical damage

8.1 When installed horizontally the membrane is suitable for use without a protection layer. Reinforcement should be placed on spreader type spacers blocks or similar. Care should be taken to avoid point loadings or damage to the membrane.

8.2 The membrane should be placed onto suitably prepared surfaces such as concrete blinding or any others advised by the Certificate holder. The membrane will not be damaged by normal foot or site traffic.

9 Adhesion and stability

The adhesion of the membrane to the substrates and to itself is satisfactory. The properties are such as to accommodate minor movements likely to occur under normal service conditions in the structure in which the membranes are incorporated.

10 Effects of temperature

The membrane remains flexible and capable of being formed at the minimum recommended temperatures (see section 13.5).

11 Maintenance

As the membrane is protected by the concrete placed against it and has suitable durability (see section 12), maintenance is not required. However, damage occurring prior to installation of the concrete must be repaired (see section 15).

12 Durability



The membrane, when fully protected and subjected to normal service conditions, will provide an effective barrier to the transmission of liquid water and water vapour and will restrict the ingress of radon, methane and carbon dioxide gases during the lifetime of the building.

Installation

13 General

13.1 Preprufe 16OR Plus must be installed in accordance with the relevant requirements of BS 8102 : 2009 and the Certificate holder's instructions. Additional guidance on the use of dpm materials is available in BS 8000-4 : 1989.

13.2 All surfaces to which the membrane is to be applied must be sound and solid to eliminate movement during the pouring of concrete. The substrate must have a smooth finish with no gaps or voids greater than 12 mm. Substrates do not require priming prior to installation of the product.

13.3 Horizontal substrates suitable for application are either of monolithic concrete construction or well compacted sand blinding on a granular fill. For use on other substrates, the advice of the Certificate holder should be sought. The substrate must be free from sharp protrusions and loose aggregate. The substrate does not need to be dry, but must be free from standing water to avoid contamination of the overlap areas.

13.4 Vertical substrates suitable for application are either of concrete or 19 mm plywood and provide support for the membrane. The plywood sheets must be closely butted and not more than 12 mm out of alignment. For use on other substrates, the advice of the Certificate holder should be sought.

13.5 The membrane must be installed at temperatures above -5°C . At temperatures below 0°C , the use of Preprufe Tape LT is required at all laps and detailing.

13.6 The membrane is supplied with coloured zip strips at the top and bottom of the seam area on the edge of the roll to enable fully-bonded laps between adjacent rolls.

14 Procedure

14.1 Edge and end laps for Preprufe 16OR Plus and end laps for Preprufe Tape must be a minimum of 75 mm. Laps must be dry, clean and free from dust.

14.2 End laps and cut edges must be overbanded using Preprufe Tape. The overlap area is wiped with a damp cloth to ensure that the area is clean and free from dust, and allowed to dry prior to jointing. The tape is centred over the lap and rolled firmly to ensure a watertight seal. The plastic release liner must be removed.

Horizontal application

14.3 The membrane is placed with the yellow zip strip facing the concrete pour. The membrane is rolled out with the PE-HD side facing the substrate.

14.4 End laps should be staggered to avoid build up of layers. The yellow and blue zip strips are left on the membrane until the overlap procedure is completed.

14.5 Subsequent sheets are positioned to overlap the preceding sheet by 75 mm along the marked selvedge. The underside of the succeeding sheet must be clean, dry and free from contamination before overlapping.

14.6 The yellow and blue zip strips are peeled back and removed from the overlap area to provide an adhesive-to adhesive bond at the overlap.

14.7 A heavy roller is used to ensure that a continuous bond is achieved without creases.

14.8 On completion of the installation, it must be ensured that all plastic zip strips have been removed from overlaps and tape.

Vertical application

14.9 The membrane is placed with the yellow strip facing the concrete pour.

14.10 The membrane is mechanically-fixed vertically using flat-headed fixings appropriate to the substrate.

14.11 The top of the membrane is secured using a batten or fixing positioned 50 mm below the top edge.

14.12 The membrane is secured flat to the substrate using fixings at 600 mm centres. Fixings can be made through the selvedge to allow firmly rolled overlaps, which are covered by subsequent strips of membrane. Any exposed fixings must be patched with Preprufe Tape.

14.13 The underside of the succeeding sheet must be clean, dry and free from contamination before overlapping.

14.14 The yellow and blue zip strips are peeled back and removed from the overlap area to provide an adhesive to adhesive bond at the overlap.

14.15 A heavy roller is used to ensure that a continuous bond is achieved without creases.

14.16 On completion of the installation, it must be ensured that all plastic zip strips have been removed from overlaps and tape.

15 Repair

Damage to the membrane can be adequately repaired by patching prior to the application of protection or backfilling. If required by the local authority, repair work should be confirmed by an independent validation report, as all gas membrane installations should be subject to third-party validation in accordance with the *Ground Gas Handbook, 2009*.

Technical Investigations

16 Tests

An assessment was made of data to EN 13967 : 2007 in relation to:

- visible defects*
- dimensions and tolerances*
- mass per unit area
- resistance to impact*
- reaction to fire*
- tensile strength and elongation* on controls and following 24 weeks at 90°C
- tear resistance*
- watertightness on controls following:
 - 12 weeks ageing at 70°C
 - 4 weeks ageing at 70°C subsequent to a compatibility with bitumen test*
 - 1 and 16 weeks immersion in lime water
- resistance to static loading*
- resistance to impact*
- joint strength*
- water vapour transmission* .

17 Investigations:

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

Bibliography

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

BS 8102 : 2009 *Code of practice for protection of below ground structures against water from the ground*

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*

EN 13967 : 2007 *Flexible sheets for waterproofing — Plastic and rubber damp proof sheets including plastic and rubber basement tanking sheet — Definitions and characteristics*

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.