# RADON MEMBRANE DETAIL

Ensure all skirtings are sealed

25mm insulation turned up at the edge of the screed

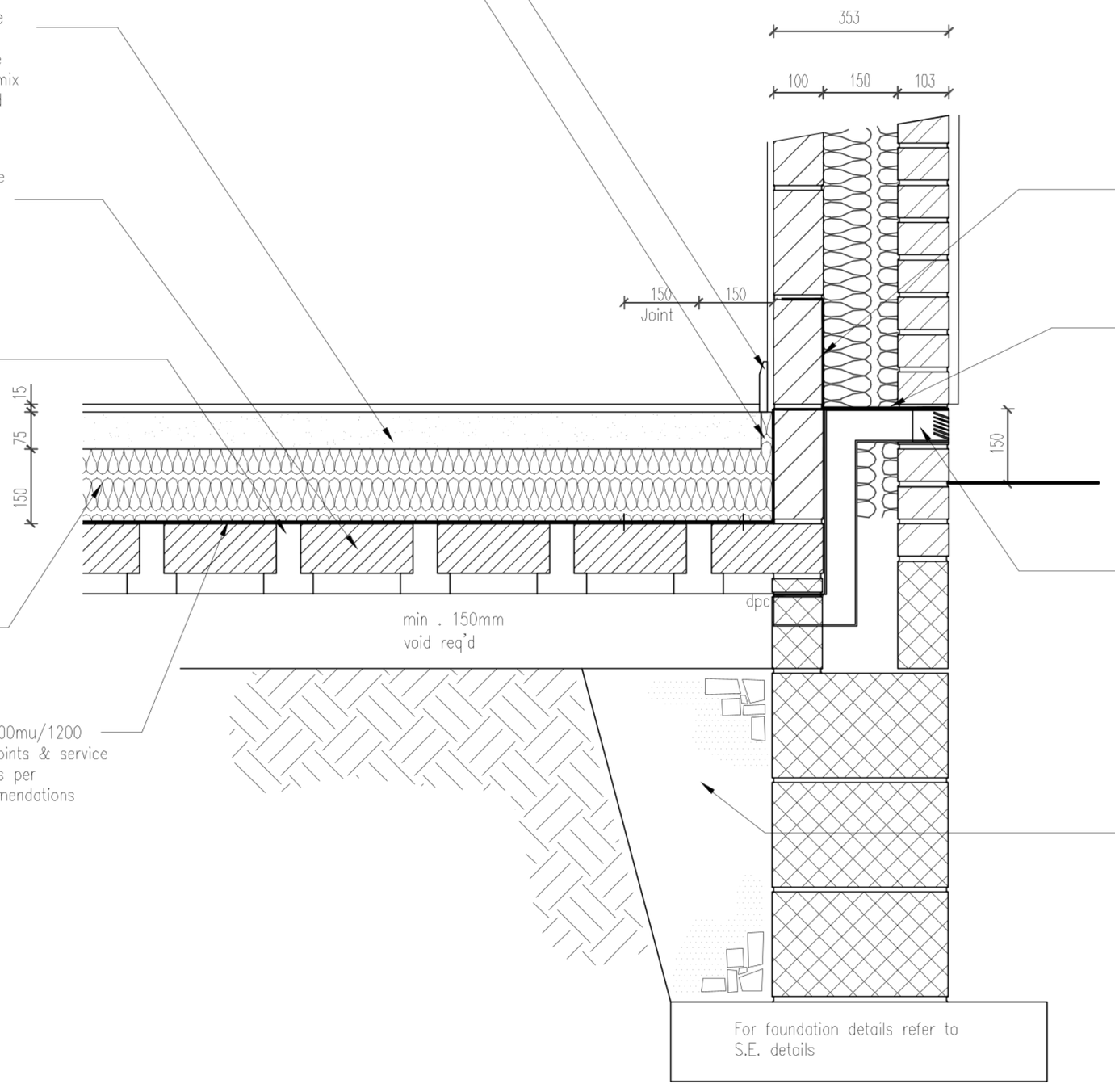
105mm (minimum 65mm) fibre reinforced screed on 120mm thick polystyrene flooring grade insulation. NOTE week mortar mix levelling slurry may be required due to opposite cambers.

For infill block specification see specialist manufacturers installation requirements. (min 7.0N)

refer to suspended floor manufacturer for depth of beams, wall closure block and dpc.s

500 guage ploythene VCL sheet or refer to insulation manufacturers details/recomendations

Keytec 400-HP Radon DPM, 300mu/1200 gauge. Lapped onto DPC. All joints & service penetrations taped & sealed as per manufacturers details & reccomendations




Wall types 1 & 2, 100mm lightweight concrete block, 100mm cavity, outer leaf.
Type 1; 102.5mm facing brick
Type 2; 100mm lightweight conrete block with 20mm render finish

Keytec 400-HP continuous cavity tray lipped up a minimum of 150mm to the outer face of the inner block leaf, behind the insulation. Taped to the DPC with 50mm jointing tape. Install proprietry weep vents to external brickwork

Keytec 400-HP Radon DPC. Approx 750mm wide. Lapped onto DPM. All joints taped & sealed as per manufacturers details & reccomendations

Air brick in DPC sleeve to proprietary ventilator see manifacturers details for no.s required in accordance with AD C4 Cavity Tray

Backfill to be even and well consolidated on BOTH sides of the external wall

For foundation details refer to S.E. details

| REVISION | DESCRIPTION | DRAWN | CHECKED | DATE |
|---|---|---|---|---|

# Radon dpm/dpc Detail

DATE 03.04.10
SCALE 1:10
DRAWN AF

DRAWING TITLE: Radon Detail
JOB TITLE: Standard Details

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**Agrément Certificate**
**16/5375**
Product Sheet 1

# KEYTEC GAS-RESISTANT MEMBRANE

## KEYTEC 400 HP GAS BARRIER

This Agrément Certificate Product Sheet[1] relates to Keytec 400 HP Gas Barrier, for use as a low-density polyethylene gas barrier and damp-proof membrane in concrete ground floors, above and 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 a 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 13).

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: 16 November 2016

John Albon – Head of Approvals Construction Products

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, Keytec 400 HP Gas Barrier, 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: | | The product can contribute to a structure 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 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 of an acceptable material. See section 13.1 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 product can contribute to a construction satisfying this Regulation. See section 13.1 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: | | The product will enable a floor to satisfy the requirements of 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 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 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) (iii)(b)(i)** | **Fitness of materials and workmanship** |
| Comment: | | The product is acceptable. See section 13.1 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 section 7.1 of this Certificate. |
| **Regulation:** | **28** | **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 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 section: 1 *Description* (1.2) of this Certificate.

# Additional Information

## NHBC Standards 2016

NHBC accepts the use of Keytec 400 HP Gas Barrier, 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.*

## CE marking

The Certificate holder has taken the responsibility of CE marking the product in accordance with harmonised European Standard 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 Keytec 400 HP Gas Barrier is a multilayer, low-density polyethylene membrane, reinforced with a polypropylene reinforcing grid with an integral aluminium foil.

1.2 The membrane has the following nominal characteristics:

| | |
|---|---|
| Thickness* (mm) | 0.6 (overall) |
| Roll length* (m) | various |
| Roll width* (m) | various |
| Mass per unit area* ($g \cdot m^{-2}$) | 350 |
| Tensile strength* ($N \cdot 50\ mm^{-1}$) | |
| MD | 600 |
| CD | 480 |
| Elongation* | |
| MD | 20 |
| CD | 20 |

| | |
|---|---|
| Nail tear resistance* | |
| MD | 330 |
| CD | 400 |
| Watertightness* | pass |
| Colour | |
| upper surface | various |
| lower surface | various. |

1.3 Ancillary products for use with the membrane include:

- Keytec butyl or Keytec bitumen tape —for joints and laps
- Keytec jointing tape — for securing laps and joints.

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

- Keytec 400 HP Top Hats — to seal around entry points to the membrane
- Keytec Internal Corner Cloaks — prefabricated corner details
- Keytec External Corner Cloaks — prefabricated corner details
- Keytec Primer — used to provide adhesion for application of bitumen enhanced geomembranes
- Keytec Void Vent 25 — cuspated HDPE drainage core with a non-woven polypropylene geotextile separator/filter bonded to one side
- Keytec Void Vent 40 — cuspated HDPE drainage core with a non-woven polypropylene geotextile separator/filter bonded to one side
- Keytec Protection Fleece — to form a protective layer to prevent damage to the membrane
- Keytec SAM — gas-resistant self-adhesive membrane.

## 2 Manufacture

2.1 The product 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 being operated by the manufacturer are being maintained.

## 3 Delivery and site handling

3.1 Rolls are wrapped in polythene film. Each roll has a leaflet enclosed describing the product and 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 mechanical damage.

# Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on Keytec 400 HP Gas Barrier.

## Design Considerations

## 4 Use

4.1 Keytec 400 HP Gas Barrier 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.

4.2 Buildings in areas of risk should be constructed in accordance with the recommendations of BRE Report BR 211 : 2015 *Radon: Guidance on protective measures for new buildings,* and following the guidance set out in BS 8485 : 2015.

4.3 The product is also satisfactory for use as a damp-proof membrane 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, provides 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.

## 7 Resistance to underground gases



7.1 The product will restrict the ingress of radon, methane and carbon dioxide gases into buildings from landfill and naturally-occurring sources and meets the performance criteria for a gas-resistant membrane as defined in BS 8485 : 2015.

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

*Table 1 Gas permeability of Keytec 400 HP*

| Gas | Method | Result |
|---|---|---|
| Methane | BS ISO 15105-1 | <0.09 $ml \cdot m^2 \cdot day^{-1} \cdot atm^{-1}$ |
| Carbon dioxide | BS ISO 15105-1 | <0.09 $ml \cdot m^2 \cdot day^{-1} \cdot atm^{-1}$ |
| Radon | K124/02/95 | $8.0 \times 10^{-15}$ $m^2 \cdot s^{-1}$ |

7.3 BRE Report BR 211 : 2015 recommends a 300 µm thick polyethylene sheet as the minimum required thickness for a radon gas-resistant membrane. It is generally accepted that other materials with comparable or higher gas resistance are suitable, provided they can withstand the construction process. In the opinion of the BBA, the product meets these criteria.

## 8 Resistance to puncture

8.1 The membrane can be punctured by sharp objects, and 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.

## 9 Compatibility with other materials

The membrane contains an aluminium foil interlay which may be subject to corrosion by alkaline conditions if damage

to the membrane and exposure occurs. However, under normal circumstances, the polyethylene faces of the membrane are compatible with other materials and products typically used in the same areas, with the exception of those containing pitch.

## 10 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.

## 11 Effects of temperature

When the membrane is loose-laid and the joints are taped, the installation temperature should not be below 5°C.

## 12 Maintenance

As the product is confined under concrete and has suitable durability (see section 13), maintenance is not required. However, any damage occurring before enclosure must be repaired (see section 16).

## 13 Durability



13.1 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.

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

# Installation

## 14 General

14.1 Keytec 400 HP Gas Barrier must be installed and fixed in accordance with the Certificate holder's instructions and the relevant clauses of BR 211 : 2015, and following the guidance of BS 8485 : 2015.

14.2 The membrane can be installed in all normal site conditions, provided that the air temperature is not below 4°C to prevent the risk of surface condensation.

## 15 Procedure

15.1 The product must only 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.

15.2 Concrete surfaces should be dense. Vertical surfaces of brickwork and blockwork must be dry and rendered to provide an even surface. Brickwork or blockwork not rendered must be flush pointed to give a smooth surface without sudden changes in level.

15.3 The membrane is rolled out with the coloured surface uppermost (white side down), ensuring that it is properly aligned. All end and side overlaps should be a minimum of 150 mm and prepared in accordance with the Certificate holder's instructions.

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

15.5 All surfaces must be dried thoroughly prior to joining. Roll edges can be welded, or taped. A strip of the tape is unrolled over the membrane with its nearest edge 50 mm from the membrane edge. The protective paper is removed from the butyl tape prior to rolling an adjacent run of the membrane, which must be carefully unrolled over the jointing tape, ensuring a 100 mm overlap.

15.6 All service penetrations and direction changes should be properly detailed in accordance with the Certificate holder's instructions. Service ducts should be vented to prevent the possibility of gas accumulating in confined spaces.

15.7 The continuity of the gas protection must extend over the footprint of the building, and the gas membrane must be sealed to a gas-resistant damp-proof course.

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

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

## 16 Repair

Any damage to the product must be repaired using a patch of the membrane, and laps welded or sealed with double-sided tape and secured with the butyl tape. All patched areas 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 BS 8485 : 2015.

# Technical Investigations

## 17 Tests

17.1 An assessment was made of data to EN 13967 : 2012 in relation to:

- tensile strength and elongation
- nail tear resistance
- watertightness
- resistance to static loading.

17.2 Tests were carried out to determine

- thickness, width, density and mass per unit area
- dimensional stability, low temperature flexibility and water vapour permeability
- tensile strength and elongation on controls, after 12 weeks heat ageing at 70°C and after 100 hours UVB exposure
- watertightness on controls and after 12 weeks heat ageing at 70°C
- nail tear strength on controls and after 12 weeks heat ageing at 70°C
- resistance of joints to air pressure
- tensile strength of joints on controls and after 12 weeks heat ageing at 70°C

to assess:

- product characteristics
- durability of the product and joints.

## 18 Investigations

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

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

18.3 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 8000-4 : 1989 *Workmanship on building sites — Code of practice for waterproofing*

BS 8485 : 2015 *Code of practice for the characterization and remediation from ground gas in affected areas*

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

BS EN ISO 14001 : 2004 *Environmental management systems — Requirements with guidance for use*

BS ISO 15105-1 : 2007 *Plastics — Film and sheeting — Determination of gas-transmission rate — Differential-pressure methods*

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

EN 13967 : 2012 *Flexible sheets for waterproofing — Plastic and rubber damp proof sheets including plastic and rubber*

## 19 Conditions

19.1 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 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.

19.2 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.

19.3 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.

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

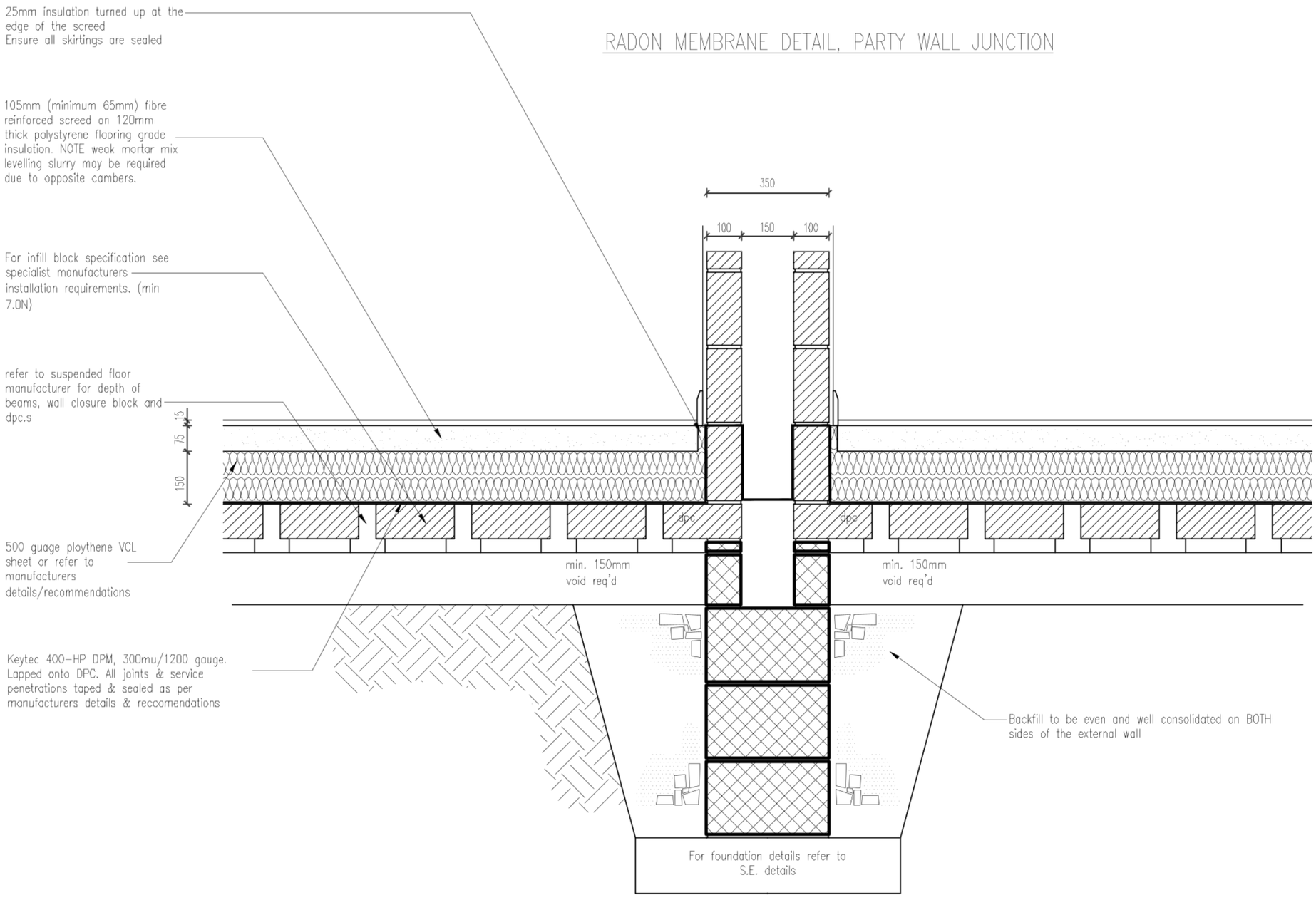
19.5 In issuing this Certificate the BBA is not responsible and is excluded from any liability to any company, firm, organisation or person, for any matters arising directly or indirectly from:

- 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.

19.6 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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# RADON MEMBRANE DETAIL, PARTY WALL JUNCTION




| REVISION | DESCRIPTION | DRAWN | CHECKED | DATE |
|---|---|---|---|---|

# Radon, Party Wall

DATE 25.06.07
SCALE 1:10
DRAWN DC

DRAWING TITLE: STANDARD DETAIL

JOB TITLE: Ground Floor Detail
Beam and Block Party Wall Junction


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