



The Irish Agrément Board is designated by Government to issue European Technical Approvals.

Irish Agrément Board Certificates establish proof that the certified products are **'proper materials'** suitable for their intended use under Irish site conditions, and in accordance with the **Building Regulations 1997 to 2002**.

The Irish Agrément Board operates in association with the **National Standards Authority of Ireland (NSAI)** as the National Member of UEAtc.



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PRODUCT DESCRIPTION

This certificate relates to DuPont Radon Plus Gas Barrier, a highly resistant radon resisting barrier, which is used as part of a Radon/Gas Protection Systems in building.

USE

The barrier is for use as a radon barrier/damp-proof membrane for solid ground floors not subject to hydrostatic pressure, but can also restrict the flow of dangerous substances from the ground such as methane and carbon dioxide from landfill and naturally occurring underground gases into buildings once installed in accordance with this certificate.

Radon (incl. Rn-222, Rn-220, RnD) is a naturally occurring radioactive gas, which enters buildings from the underlying soil. The gas can accumulate within a building to such a concentration as to constitute a health hazard.

Radon is excluded from buildings using passive and active systems. The provision of a suitable protection system, designed and installed by competent personnel, will substantially reduce the risk of a building having radon activity above the national reference level of 200

Bq/m³ recommended by the Radiological Protection Institute of Ireland (RPII).

Passive control systems consist of a radon resisting membrane extending across the whole of the building, including the floor and walls. These systems should also incorporate an underfloor ventilated sump or sumps, which can be subsequently converted into an active control system by the use of suitable ventilation fans.

MANUFACTURE

The product is manufactured by:

DuPont Engineering Products s.á.r.l.
Rue General Patton, L – 2984, Luxembourg.

SALES AND MARKETING

The product is marketed by

Insulation Distributors Ltd.,
Unit 15, Parkwest Industrial Park,
Nangor Road, Dublin 12.
Tel: 01-6234541 Fax: 01-6234553
E-mail: sales@insulationdistributors.ie
Webster: www.insulationdistributors.ie

1.1 ASSESSMENT

In the opinion of the Irish Agrément Board (IAB), DuPont Radon Plus Gas Barrier is satisfactory for the purposes defined above, and meets the requirements of the Building Regulations 1997 to 2002 as indicated in Section 1.2 of this Certificate.

1.2 BUILDING REGULATIONS 1997 to 2002**REQUIREMENTS****D1 & D3 - Materials and Workmanship**

D3 - DuPont Radon Plus Gas Barrier, as certified in this Irish Agrément Board Certificate, is a 'proper material' fit for its intended use. (See Part 4 of this Certificate).

D1 - DuPont Radon Plus Gas Barrier, used in accordance with this Irish Agrément Board Certificate, meets the requirements for workmanship.

A1 - Loading

DuPont Radon Plus Gas Barrier installed in accordance with this Irish Agrément Board Certificate, will not adversely affect the designed safety and deflection characteristics of a building.

B3 (3) - Internal Fire Spread

DuPont Radon Plus Gas Barrier, installed in accordance with this Irish Agrément Board Certificate, will not adversely affect the control of fire and smoke within concealed spaces in the structure or fabric of a properly designed building.

C3 - Dangerous Substances

Every ground floor must include a radon sump and provide the facility for extracting radon.

Where it is shown that protection from dangerous substances e.g. radon, methane is required an approved gas resistant barrier must be provided under the ground floor (See Section 3.1.5 of this Certificate).

DuPont Radon Plus Gas Barrier, when used as an integral part of a radon protection system, will meet this requirement with respect to radon gas.

C4 - Resistance to Weather and Ground Moisture

DuPont Radon Plus Gas Barrier, when used in accordance with Part 3 of this Certificate, will meet this requirement.

Part L - Conservation of Fuel and Energy

DuPont Radon Plus Gas Barrier can be detailed as illustrated in Figures 6 to 12, to meet the elemental and overall U-value requirement of Part L of the Building Regulations 1997 to 2002.

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2.1 PRODUCT DESCRIPTION

This Certificate relates to DuPont Radon Plus Gas Barrier which is a 3 layer gas barrier incorporating one layer High Density Polyethylene (HDPE) a reinforcing polyester grid between 2 layers of linear Low Density Polyethylene (LLDPE). The barrier is red in colour and is 0.33 mm in total thickness. Table 1 gives the standard roll specifications.

Table 1: Standard Roll Specification

Roll Thickness (mean)	0.33mm
Standard Roll Width	3 m
Standard Roll Length	16.6 m, 25 m, 33 m
Standard Roll Weight	17 kg, 26 kg, 34 kg
Colour	Red

2.1.1 Ancillary Products

Ancillary products also available from the manufacture for use with the barrier include:

Radon resisting sealant tape (a 30mm wide double-sided tape) for joining side and end overlaps of the membrane.

It is essential that these products are laid in accordance with the recommendations of IS 325: Part 2: 1995 *Code of Practice for use of Masonry*, BS 8102: 1990 *Code of Practice for Protection of structures against water from the ground*, BS 8215: 1991 *Code of Practice for design and installation of damp-proof courses in masonry construction*, and clause 11 of BS CP 102: 1973 '*Code of Practice for protection of buildings against water from the ground*', and with the requirements of this Certificate.

2.2 MANUFACTURE

DuPont Radon Plus Gas Barrier is manufactured by an extrusion and lamination process. The physical characteristics of the product are given in Table 2.

2.2.1 Product Quality Control

Quality control checks are carried out on the raw material, during production and on the final product.

Table 2: Physical Characteristics

Weight per unit area	Mean Value	340 g/m ²
Thickness	Minimum thickness	314 microns
Radon Permeability	SP Swedish National Testing and Research Institute (in-house procedure)	≤ 8 x 10 ⁻¹² m ² /s
Radon Transmission		18 x 10 ⁻⁹ m ² /s
Moisture Vapour Transmission Tested at (25Deg. C 75% RH)	BS 3177: 1959 (1995)	(@25 deg C, 75%RH) 0.25 g/m2/24h

Quality control checks in production include checks on thickness, adhesion and weight. In addition to this each jumbo reel is tested for tensile strength, bursting strength and tear resistance.

Quality Control on the final product includes checks on density, melt flow indices, dart impact strength, weight and dimensions.

2.3 DELIVERY, STORAGE AND MARKING

Rolls are wrapped individually in polyethylene film and are placed on pallets. Each roll is labelled with a wrapper bearing the manufacturer's name and product description, IAB logo and Certificate number and essential instructions for storage and installation. Rolls should be laid flat on a smooth, clean surface and be kept under cover to protect the barrier from long-term exposure to UV light rays. The marketing company's address and contact details are also displayed on the label. DuPont Radon Plus is also printed on the membrane itself in white.

2.4 INSTALLATION

2.4.1 General

Guidance on the design of radon protection systems for new and existing buildings is given in the DOELG Documents. 'Radon in Buildings', and 'Radon in Existing Buildings' and in the BRE (UK) Document: 'Radon - Guidance on protective measures for new dwellings'.

2.4.2 Design Details

DuPont Radon Plus Gas Barrier can be used in most common floor constructions. The barrier is installed in a

similar way to damp proof membrane installation but with the exception of the radon-resisting barrier having to be installed gas tight. **The barrier must be installed gas tight to the external perimeter of the building being protected.** This can only be achieved by giving proper attention to sealing details and workmanship. Figures 1, 2 and 3 respectively show how the DuPont Radon Plus

Plus Gas Barrier is to be sealed at overlaps and where penetrations occur at pipes and steel stanchions.

Installation of the radon resistant barrier on building sites is generally the responsibility of the main contractor. It is recommended where possible that the installation of a radon resistant barrier be carried out by specialist installers. Operatives installing a radon-resisting barrier should be trained in the principles of sealing and movement joint control. Advice and technical back up support is available from the distributor.

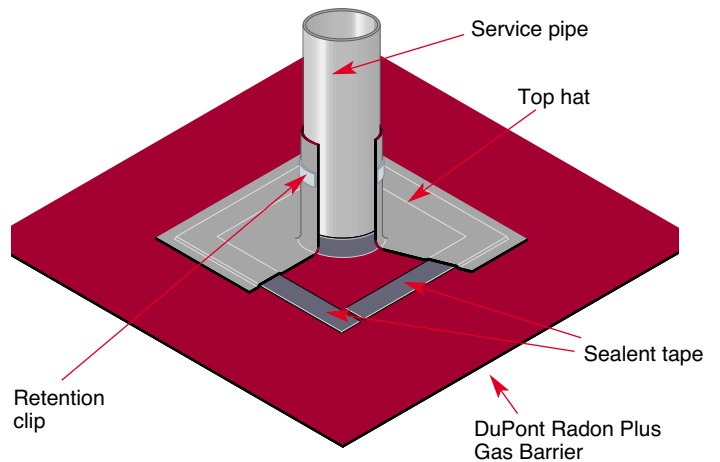


Fig. 2 Sealing at pipe penetration

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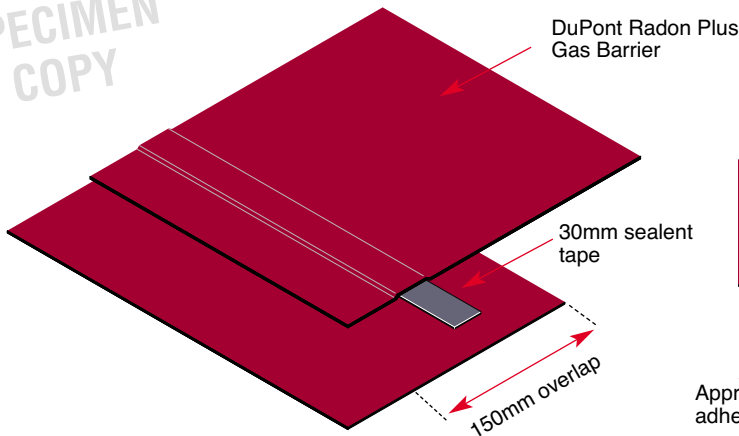


Fig. 1 Sealing at overlaps

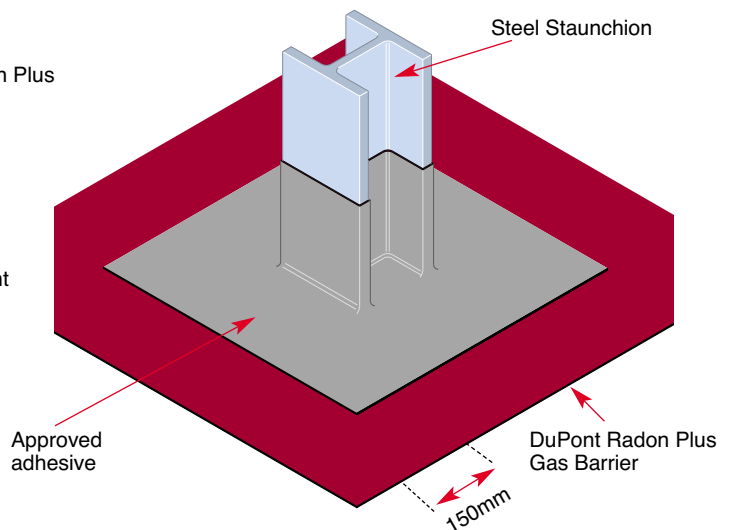


Fig. 3 Sealing around steel stanchions

To achieve a gas tight installation all cavities in walls must be bridged and in doing so should form a cavity tray. Where necessary narrow strips of membrane can be used to seal walls and cavities. All designed cavities must be properly closed. Figures 6 to 12 show how the cavities in walls are bridged for various forms of construction.

To avoid creating slip planes in masonry walls a damp proof course should not be laid on the same course of blockwork as the DuPont Radon Plus Gas Barrier (see the recommendations in IS 325: Part 2: 1995 *Code of Practice for use of masonry. Part 2 Masonry Construction*).

Consideration must be given to the positioning of a radon resisting membrane in relation to thermal insulation. The recommendations contained in IS 325: Part 2 1995 *Code of Practice for use of masonry. Part 2 Masonry Construction*, and the BRE Report, *'Thermal insulation - avoiding risks'* should be followed.

The integrity of a radon resisting barrier must be maintained during installation. DuPont Radon Plus Gas Barrier is resistant to puncturing and tearing, but where damage occurs this must be repaired by covering with a second layer of the same material which is sealed to the original using radon sealant tape.

Installation of DuPont Radon Plus Gas Barrier must be in accordance with the recommendations of IS 325: Part 2, 1995: *'Code of Practice for use of masonry'* and clause 11 of BS CP 102: 1973: *'Code of Practice for protection of buildings against water from the ground'*, and the requirements of this Certificate. Additional guidance on the use of damp proof membrane materials is given in BS 8000: Part 4. 1989 *'Code of Practice for waterproofing'*

2.4.3 Installation Procedure

The sub-structure beneath the ground floor should be free of topsoil and vegetable matter. The base of the excavation must be flat, even and filled with a clean grade hardcore which is then properly compacted. A surface blinding of minimum 50mm soft sand is then applied to prevent puncture of the barrier during installation. Protection over the membrane is afforded by using high-density insulation (25kg/m³).

The barrier must be clean and free from dirt and grease before application, and in view of the difficulty of achieving gas tight seals under wet or dirty site conditions it is recommended that special care be taken with this aspect of the installation.

Unroll one width of the barrier after determining the most effective method of covering the area. Adjacent layers of the barrier should be overlapped by at least 150mm. Apply the sealant tape about 50mm from the edge, leaving the backing paper on. Lay the next width of barrier overlapping the first by 150mm as shown in Figure 1. Remove the backing paper from the sealant tape and join the top layer to the bottom layer by applying pressure with a hand roller. When the weather is cold keep the sealant tape in a warm place until required for use, and if necessary apply a little hot air but never use a naked flame.

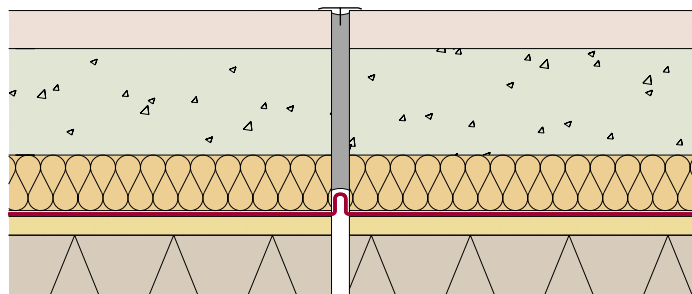


Fig. 4 Typical movement control joint

Where service ducts or pipes penetrate the barrier gas tight seals are achieved using sealant tape and top hat units with retention clips as shown in Figure 2.

Pipes, steel stanchions, concrete columns etc., can be sealed using an approved adhesive bituminous gas resisting membrane (as recommended by the manufacturer of the radon resisting barrier) with an overlap of 150mm on each surface and rolled firmly (see Fig. 3). Steel, concrete and masonry surfaces should be primed, in accordance with the primer manufacturer's instructions, prior to the adhesive membrane being laid. This method can also be adopted to seal pipe collars.

A screed, high-density insulation or other protective layer must cover the radon-resisting membrane as soon as possible after installation. Care should be taken to ensure that the barrier is not damaged, stretched or displaced when the screed or concrete floor is being poured, especially if the floor is being power floated. Great care should be taken to avoid bridging (i.e. creating areas of unsupported barrier) during screeding operations, for example at internal angles.

2.4.4 Provision for Settlement.

SITUATION A

If it can be predicted, with certainty, that there will be no actual/real relative or differential settlement during the entire life cycle of a building then the radon-resisting membrane may be installed as shown in Fig. 5a and Fig. 9.

Fig. 5a (Straight through)

SITUATION B

If it can be predicted, with certainty that the actual/real relative or differential settlement during the entire life cycle of a building will not exceed 8mm then the radon-resistant membrane may be installed with an upstand as shown in Fig. 5b and Fig. 8.

Fig. 5b 15mm (Upstand)

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SITUATION C

If it cannot be predicted, with certainty, what the actual/real relative or differential settlement will be during the entire life cycle of a building then the radon-resistant membrane should be installed with folds as shown in Fig. 5c, Fig. 6 and Fig. 7.

Fig. 5c Folds



Fig. 6 Ground bearing floor slab with rising blockwork incorporating DuPont Radon Plus Gas Barrier.

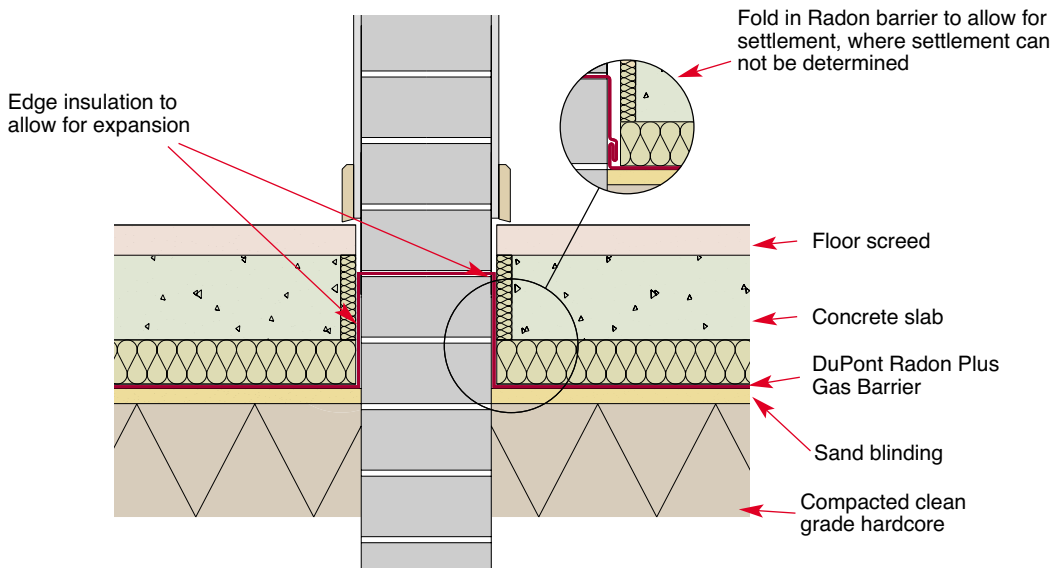
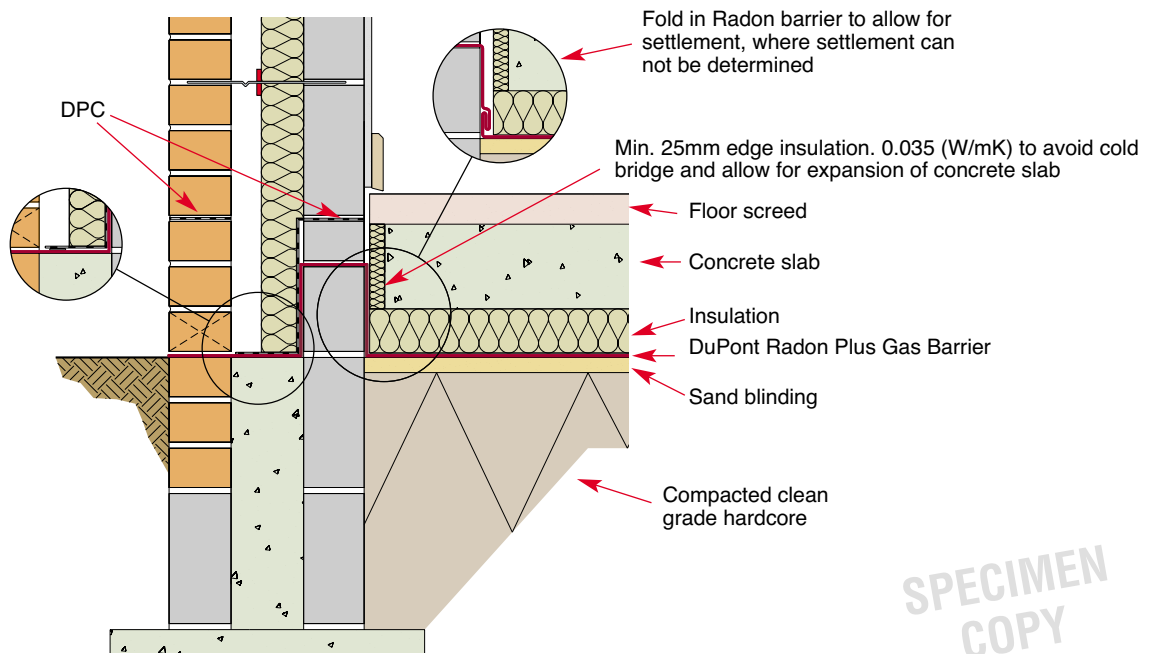


Fig. 7 Radon barrier detail at junction with loadbearing internal rising wall

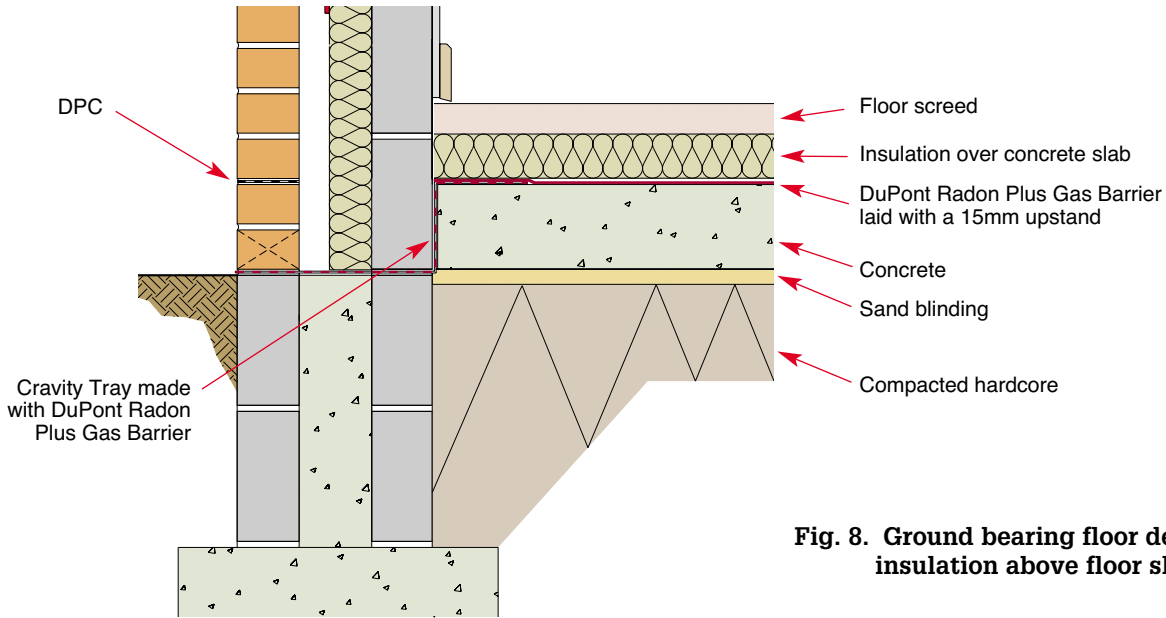


Fig. 8. Ground bearing floor detail with insulation above floor slab

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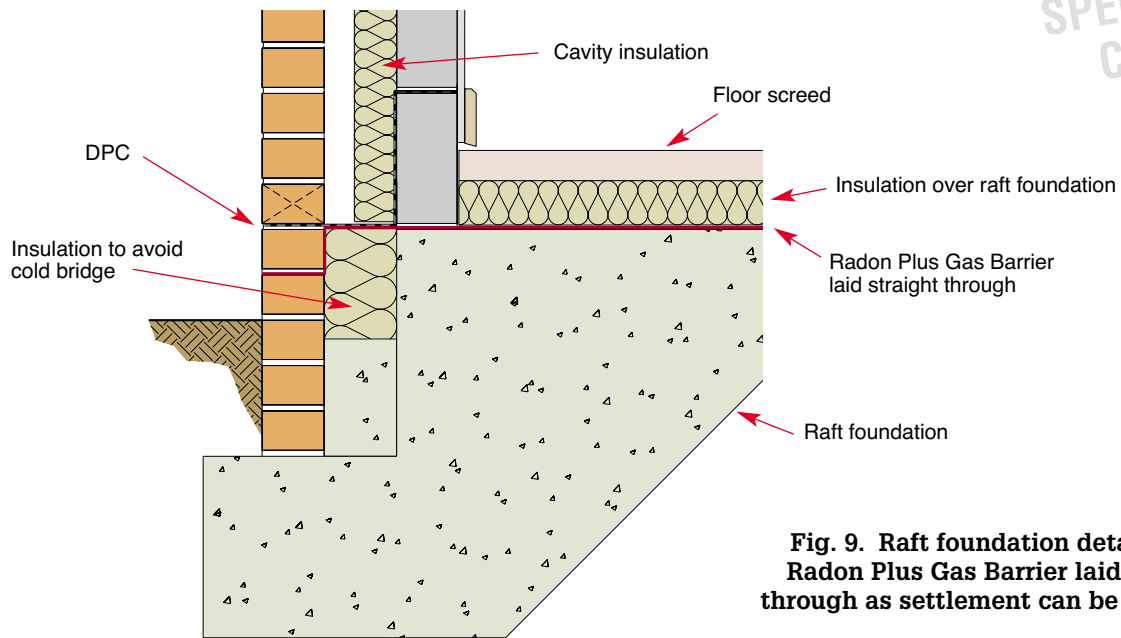


Fig. 9. Raft foundation detail with Radon Plus Gas Barrier laid straight through as settlement can be predicted

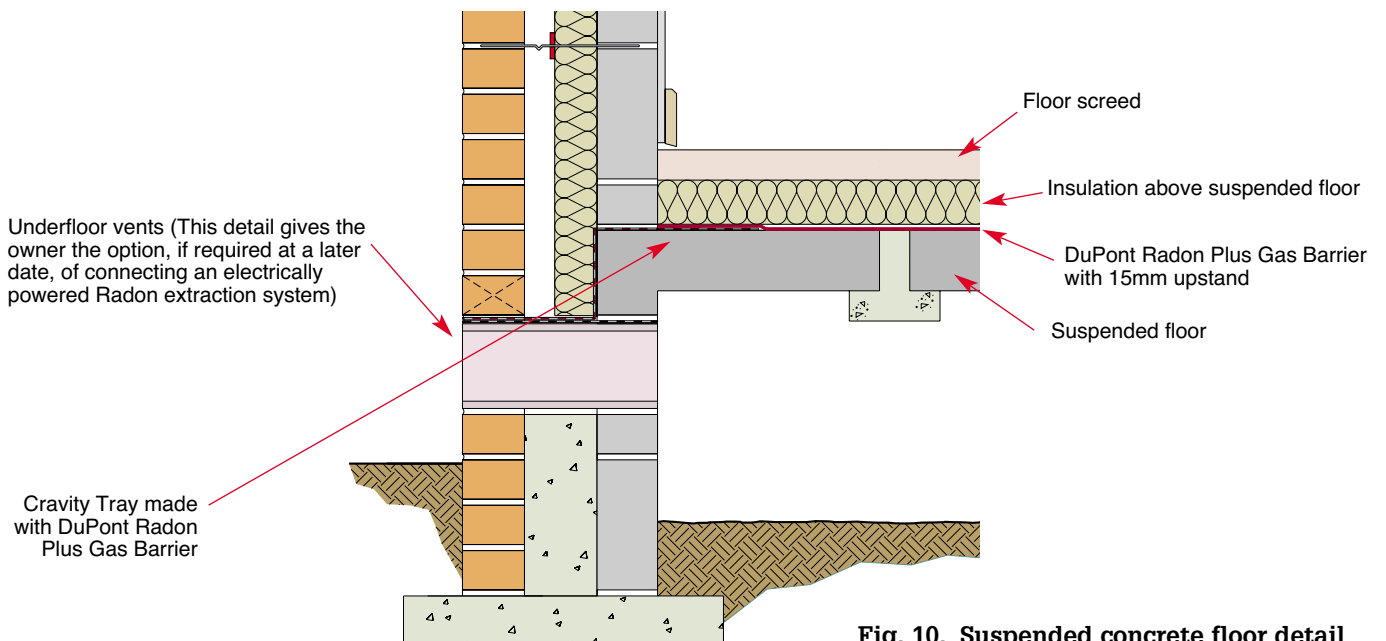


Fig. 10. Suspended concrete floor detail

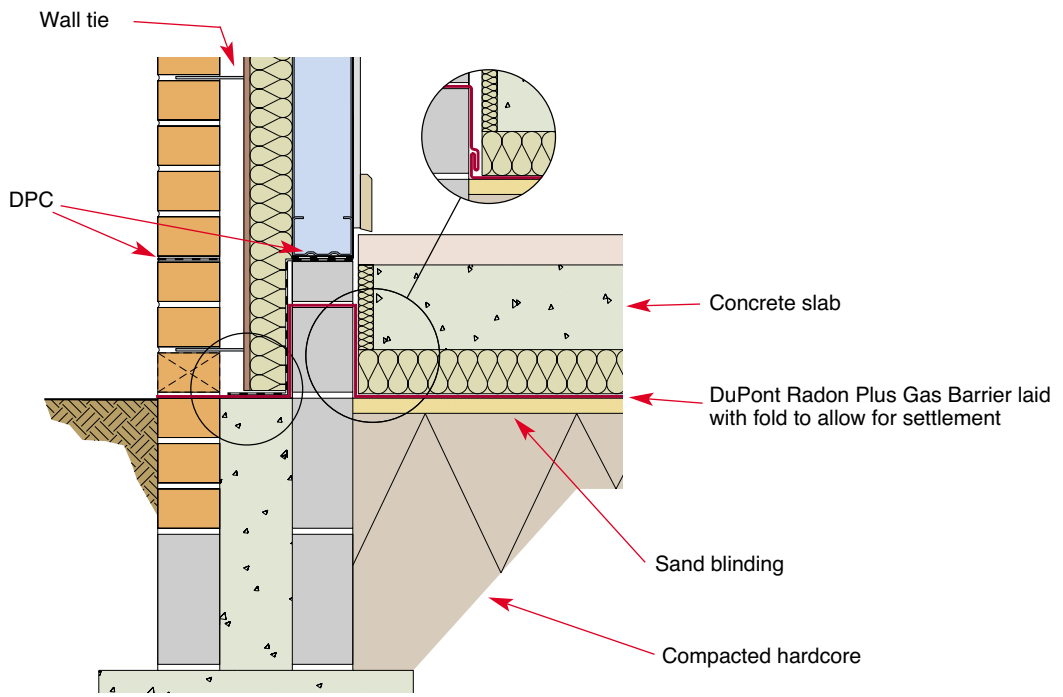


Fig. 11. Steel frame detail incorporating DuPont Radon Plus Gas Barrier

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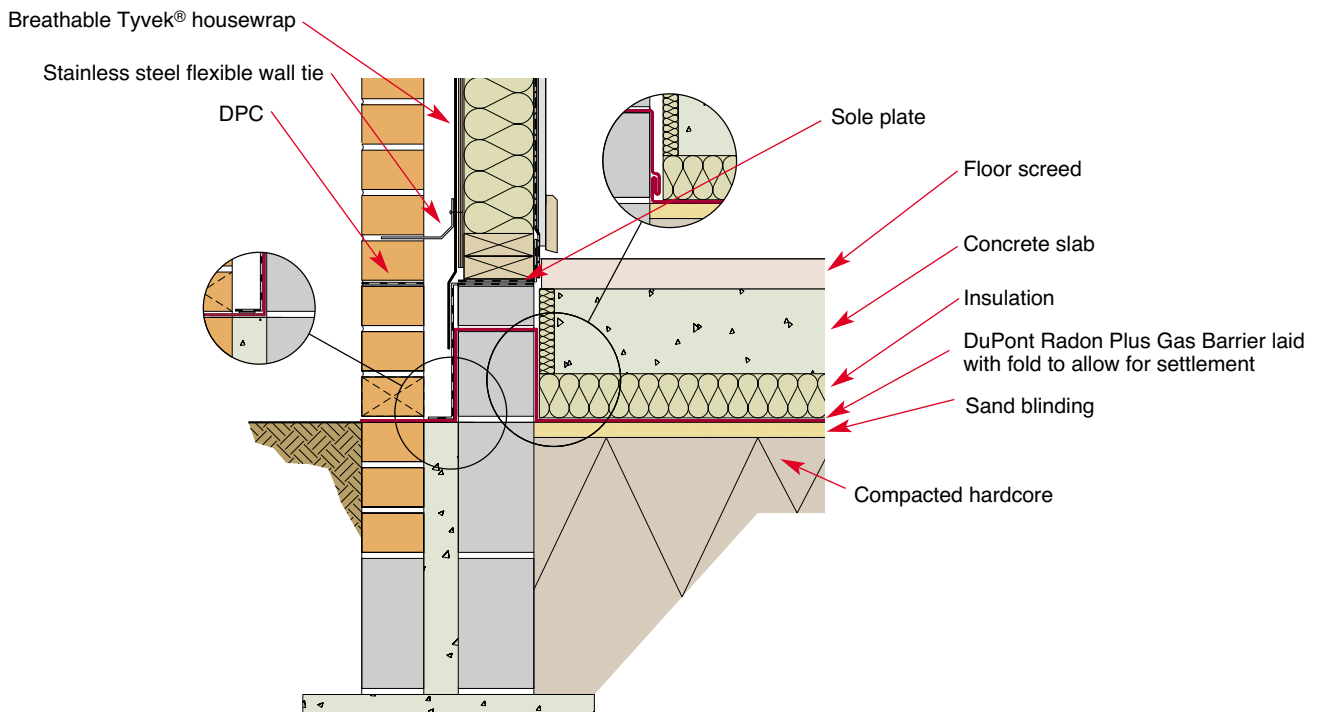


Fig. 12. Timber frame detail on rising blockwork incorporating DuPont Radon Plus Gas Barrier

3.1 GENERAL

DuPont Radon Plus Gas Barrier is suitable for use in concrete floors not subject to hydrostatic pressure, in accordance with the relevant clauses of IS 325: Part 2: 1995 *Code of Practice for use of masonry* and of BS CP 102: 1973: '*Code of Practice for protection of buildings against water from the ground*'.

The product is installed as an oversite barrier, either between a blinded hardcore bed and the base concrete, or between the base concrete and screed. The hardcore used must be compacted with clear graded crushed stone (grade 804 or equivalent) and blinded with a 50mm thick layer of sand to ensure that there is no risk of protrusions which could puncture the radon resisting barrier.

3.1.1 Resistance to Radon, Water and Water Vapour.

The barrier and the methods of jointing provide an effective barrier to the passage of radon gas, liquid water and water vapour from the ground.

3.1.2 Resistance to Tear.

The product has a high resistance to tear (see Table 3). Care should be taken during installation, particularly when handling building materials and equipment over the surface and when placing concrete or screeds, since sharp objects can puncture the barrier. High-density insulation (25kg/m³) is an effective protection after laying the barrier.

3.1.3 Site Conditions.

The product may be installed in all conditions normal to ground floor slab construction. Where there is a risk of ground becoming waterlogged, sub-soil drainage must be provided in accordance with IS 325: Part 2: 1995 *Code of Practice for use of masonry* and BS CP 102:1973: '*Code of Practice for protection of buildings against water from the ground*'.

3.1.4 Underfloor Heating.

When used in accordance with the conditions set out in this Certificate, there will be no adverse effect on the barrier from underfloor heating under normal conditions. The manufacturer's advice should also be sought for project specific details.

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Table 3 - Technical Data

Test (Units)	Method	Mean Results (Directional)	
		Long	Transverse
Tensile Strength (N per 50mm) unaged	IS EN ISO 527-3:1996 (100mm min-1)	332	348
Tensile Strength (N per 50mm) heat aged	IS EN ISO 527-3:1996 (100mm min-1)	348	346
Tensile Strength (N per 50mm) UV aged	IS EN ISO 527-3:1996 (100mm min-1)	340	343
Elongation % (at max load %) unaged	IS EN ISO 527-3:1996 (100mm min-1)	15	20.5
Elongation % Heat aged	IS EN ISO 527-3:1996 (100mm min-1)	15.3	21.5
Elongation % UV aged	IS EN ISO 527-3:1996 (100mm min-1)	15.2	17.2
Nail Tear Resistance unaged	MOAT 27: 1983 (5.4.1)	183	191
Nail Tear Resistance heat aged	MOAT 27: 1983 (5.4.1)	166	187
Low Temperature flexibility 0°C	MOAT 27: 1983 (5.4.2)	-25 No damage	-25 No damage
Resistance to leakage at joints	MOAT 27:1983 (5.2.1)	No Leaks	
Shear at joints (tensile strength) Heat aged at 28 days at 80°C	MOAT 27:1983 (5.2.2)	253 N	

3.1.5 Location of Building

The designer of a building before construction must check the location of the building with regards to radon. The (Radiological Protection Institute of Ireland) RPII have produced detailed maps of Ireland outlining areas where there exists an increased risk of high radon values. These maps should be checked before designing a building.

3.2 CONSTRUCTION DETAILING

To reduce radon gas migration ingress into buildings the following guidelines should be followed:

- Design for controlled movement of construction (see IS 325: Part 2).
- Ensure that all designed cavities are effectively closed to interior spaces.
- Design for grouping of services, with effective gas seal of ground slab openings and penetrations.
- Avoid downstand beams and limit number of rising walls beneath ground slabs, which provide confined spaces for radon gas accumulation.
- Maximize underfloor ventilation, where practicable, and in a manner compatible with the energy conservation performance of the building.

- Design interior spaces for maximum ventilation, in a manner compatible with the energy conservation performance of the building.

3.3 CONSTRUCTION SETTLEMENT

Consideration should be given to differential and/or relative settlement of ground floor construction during the full life cycle of a building.

Where special installation detailing is introduced, i.e. folding of a radon resisting barrier at critical construction points, an elongation capability for the barrier itself may not be required. Where high concentrations of radon is likely and where a building is properly designed, detailed and constructed to take account of settlement, the installation of DuPont Radon Plus Gas Barrier represents an effective measure against radon health hazards.

- **It is important to note that following any elongation in a membrane a reduction in its radon gas resistance performance will occur.**

4.1 TESTS/ASSESSMENTS

Technical investigations were carried out on DuPont Radon Plus Gas Barrier.

Typical results are shown in Tables 2 and 3.

4.2 MAINTENANCE

No maintenance of a radon resisting membrane is required when installed in accordance with this Certificate. However as it is impractical to assess the severity of a radon problem on a particular site accurately until the building has been constructed and occupied, it is recommended that 3 month radon measurements be conducted on buildings that are occupied. This testing will determine if the radon-resisting barrier has been installed correctly and is performing correctly. Radon detectors are available from the Radiological Protection Institute of Ireland (RPII). If radon levels are above that permitted then radon may be extracted using proprietary extraction radon systems. For radon extraction in existing buildings reference should be made to DOELG publication 'Radon in Existing Buildings Corrective Options'.

4.3 DURABILITY

When installed in accordance with this Certificate and subject to normal conditions of use, the DuPont Radon Plus Gas Barrier will provide an effective barrier, which will be substantially impervious to the transmission of radon gas, liquid water and water vapour for the life of the building.

Long periods of exposure to ultraviolet light can reduce the effectiveness of a membrane. However, once stored in accordance with section 2.3 of this Certificate and when installed in accordance with this Certificate, the membrane will be protected from such exposure.

It is important to note that alterations to the building structure subsequent to the installation of a radon protective system must take into account the integrity of the barriers.

4.4 OTHER INVESTIGATIONS

- Existing data on properties in relation to fire, and toxicity, were assessed. When stored with normal care on site prior to installation the Barrier does not present a significant fire or health hazard.
- The manufacturing process was examined including the methods adopted for product quality control, and details were obtained of the quality and composition of the materials used.
- Site visits were conducted to assess the practicability of installation.

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5.1 CONDITIONS OF CERTIFICATION

The National Standards Authority of Ireland (“NSAI”) following consultation with the Irish Agrément Board (“IAB”) has assessed the performance and method of installation of the product/process and the quality of the materials used in its manufacture and certifies the product/process to be fit for the use for which it is certified provided that it is manufactured, installed, used and maintained in accordance with the descriptions and specifications set out in this certificate and in accordance with the manufacturer’s instructions and usual trade practice. This certificate shall remain valid so long as:

- (a) the specification of the product is unchanged;
- (b) the Building Regulations, 1997 to 2002 and any other regulation or standard applicable to the product/process, its use or installation remain unchanged;
- (c) the product continues to be assessed for the quality of its manufacture and marking by NSAI;
- (d) no new information becomes available, which in the opinion of the NSAI would preclude the granting of the certificate;
- (e) the product or process continues to be manufactured, installed, used and maintained in accordance with the description, specifications and safety recommendations set out in this certificate.

5.2 The IAB mark and certification number may only be used on or in relation to products/processes in respect of which a valid certificate exists. If the certificate becomes invalid, the certificate holder must not use the IAB mark and certification number and must remove them from products already marked.

5.3 In granting this certificate, the NSAI makes no representation as to:

- (a) the presence or absence of patent rights subsisting in the product/process; or
- (b) the legal right of the certificate holder to market, install or maintain the product/process; or
- (c) whether individual products have been manufactured or installed by the certificate holder in accordance with the descriptions and specifications set out in this certificate.

5.4 This certificate does not comprise installation instructions and does not replace the manufacturer’s directions or any professional or trade advice relating to use and installation which may be appropriate.

5.5 Any recommendations contained in this certificate relating to the safe use of the certified product or process are preconditions to the validity of the certificate. However, the NSAI does not certify that the manufacture or installation of the certified product or process in accordance with the descriptions and specifications set out in this certificate will satisfy the requirements of the Safety, Health and Welfare at Work Act, 1989 or of any other current or future statute or current or future common law duty of care owed by the manufacturer or by the certificate holder.

5.6 The NSAI is not responsible to any person or body for loss or damage, including personal injury, arising as a direct or indirect result of the use of this product or process.

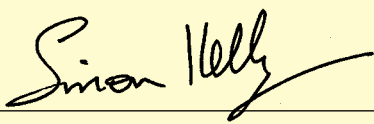
5.7 Where reference is made in this certificate to any Act of the Oireachtas, regulation made thereunder, statutory instrument, code of practice, national standards, manufacturer’s instructions or similar publication, it shall be construed as reference to such publication in the form in which it is in force at the date of this certification.

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THE IRISH AGRÉMENT BOARD

This Certificate No. 02/0154 has been granted by the NSAI to Dupont Engineering Products s.á.r.l. Rue General Patton, L - 2984, Luxembourg on behalf of The Irish Agrément Board.

Date of Issue: May 2002

Signed: 

Chief Executive, NSAI

Readers may check that the status of this Certificate has not changed by contacting the

Irish Agrément Board,
NSAI, Glasnevin, Dublin 9. Ireland.

Telephone: (01) 8073800.
Telefax: (01) 8073842
www.n Sai.ie

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BUILDING PRODUCT CERTIFICATION

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