



**NSAI**  
Agrément

**IRISH AGRÉMENT BOARD  
CERTIFICATE No. 03/0115**

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## Radbar Radon & CO<sub>2</sub> Resisting Membrane

**Membranes résistantes au Radon (F)  
Anti-Radon Membran (D)**

**NSAI Agrément (Irish Agrément Board)** is designated by Government to issue European Technical Approvals.

NSAI Agrément 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 2008**.



### PRODUCT DESCRIPTION:

This Certificate relates to Radbar radon and CO<sub>2</sub> resisting membrane. The product is used as part of radon/gas protection systems in buildings.

This Certificate certifies compliance with the requirements of the Building Regulations 1997 to 2008.

### USE:

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 a recommended target health level of 10-40 Bq/m<sup>3</sup> (USA).

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 (see Figure 6) which can be subsequently converted into an active control system by the use of suitable ventilation fans.

A radon resisting membrane when installed in accordance with this Certificate, will also act as a damp proof membrane to protect the building against the ingress of moisture from the ground.

### MANUFACTURE AND MARKETING:

The product is manufactured and marketed by:

Capital Valley Plastics Ltd.,  
Cwmavon Works,  
Nr. Pontypool,  
Gwent NP4 8UW,  
UK.

## 1.1 ASSESSMENT

In the opinion of NSAI Agrément, Radbar, if used in accordance with this Certificate can meet the requirements of the Building Regulations 1997 - 2008 as indicated in Section 1.2 of this Certificate.

## 1.2 BUILDING REGULATIONS 1997 to 2008 REQUIREMENT:

### **Part D – Materials and Workmanship**

**D3** –Radbar, as certified in this NSAI Agrément Certificate is comprised of proper materials fit for their intended use (see Part 4 of this Certificate).

**D1** –Radbar, as certified in this Certificate, meets the requirements for workmanship.

### **Part A – Structure**

#### **A1 – Loading**

Radbar, installed in accordance with this Certificate, will not adversely affect the designed safety and deflection characteristics of a building.

### **Part B – Fire Safety**

#### **B3 – Internal Fire Spread (Structure)**

Radbar, installed in accordance with this Certificate, will not adversely affect the control of fire and smoke within concealed spaces in the structure or fabric of a properly designed building.

### **Part C – Site Preparation and Resistance to Moisture**

#### **C3 – Dangerous Substances**

Radbar, when used as an integral part of a radon protection system, will meet the requirement with respect to radon gas.

#### **C4 – Resistance to Weather and Ground Moisture**

Radbar, when used in accordance with Part 3 of this Certificate, will meet this requirement.

## 2.1 PRODUCT DESCRIPTION

This Certificate relates to the Radbar radon and CO<sub>2</sub> resisting membrane. The product is manufactured from polyethylene blown film 300µm in single layer form.

Accessories: Radon resisting sealant tape, top hat units for pipes penetrating the floor (complete with retention clips), and an approved adhesive bituminous gas resisting membrane.

It is essential that these products are laid in accordance with the recommendations of IS 325-2:1995 *Code of practice for use of masonry – Masonry construction*, BS 8102:1990 *Code of practice for protection of structures against water from the ground*, and with this Certificate.

## 2.2 MANUFACTURE

Radbar is manufactured by the blown film process from a single layer polyethylene (see Figure 1).

### 2.2.1 Product Quality Control

Quality control checks are carried out on the raw material, during production and on the final product. Quality control on the final product includes checks on density, melt flow indices, thickness of membrane, roll width, dart impact strength, weight and dimensions.

## 2.3 DELIVERY, STORAGE AND MARKING

Rolls are supplied individually or on pallets in wrappers bearing the manufacturer's name and product description, NSAI Agrément identification mark, NSAI Agrément Certificate number and essential instructions for storage and installation.

## 2.4 INSTALLATION

### 2.4.1 General

Guidance on the design of radon protection systems for new and existing buildings is given in the DoEHLG document *Radon in Buildings*, 1995.

### 2.4.2 New Work

Radbar can be used in most common ground floor constructions. Radbar is installed in a similar way to damp proof membranes **but with much greater attention to detailing and workmanship**. The radon resisting membrane will also perform the same function as damp proof membranes.

Figure 1 – 11 illustrate typical examples of the correct detailing required when installing Radbar and its accessories.

To be fully effective, a radon, resisting membrane must bridge cavities in walls 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.

Properties	Radbar	Test Method
Colour	Green	
Thickness (µm)	300	
Standard Roll Size (m)	4x20, 3.6x20	
Mass (g/m <sup>2</sup> )	276	BS 2782-6:1991 (1996)
Tensile Strength (N)	164-182	MOAT 27 Method 620A
% Elongation at break	Long. 713 Trans. 743	BS 2782:1976 (1996) Method 320A
Tear Strength (N)	Long. 140 Trans. 140	BS 2782-3:1991 (1996) Method 360B
Water Vapour Resistance (MNs/g)	708	BS 3177:1959 (1995)
Water Vapour Transmission Rate (g/m <sup>2</sup> /day)	0.29	BS 3177:1959 (1995)
Radon Permeability (10 <sup>-12</sup> m <sup>2</sup> /s)	8±15%	Laboratory test with radon gas (Rn-222)
Radon Transmittance (10 <sup>-9</sup> m/s)	22±15%	Laboratory test with radon gas (Rn-222)
Dart Impact Resistance (g) Main Film Edge Fold	980 350	BS 2782-3:1996 Method 352F
Roll weight (kg)	22.08, 19.87	

**Table 1: Technical Data**

To avoid creating slip planes in masonry walls, do not set a dpc in contact with a radon resisting membrane (see the recommendations in IS 325-2:1995).

Consideration must be given to the positioning of a radon resisting membrane in relation to thermal insulation. The recommendations contained in IS 325-2:1995 should be followed.

The integrity of a radon resisting membrane must be maintained during installation. The Radbar radon resisting membrane is resistant to puncturing and tearing, but where damage occurs this must be repaired by covering with a second layer of membrane sealed to the original using a radon sealant tape.

Installation of the Radbar radon resisting membrane must be in accordance with the recommendations of IS 325-2:1995, BS 8102:1990, and the requirements of this Certificate. Additional guidance on the use of damp proof membrane materials is given in BS 8000:Part 4:1989 *Workmanship on building sites – Code of practice for waterproofing*.

The ground beneath the ground floor should be free of topsoil and vegetable matter. The bottom of the excavation must be flat, even, properly compacted and sand blinding with a minimum thickness of 50mm. The proper compaction of hardcore and sand blinding prevents puncture of the membrane during installation. A further protection over the membrane is afforded by using high density insulation (25 kg/m<sup>3</sup>).

Sheets 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 is taken with this aspect of the installation.

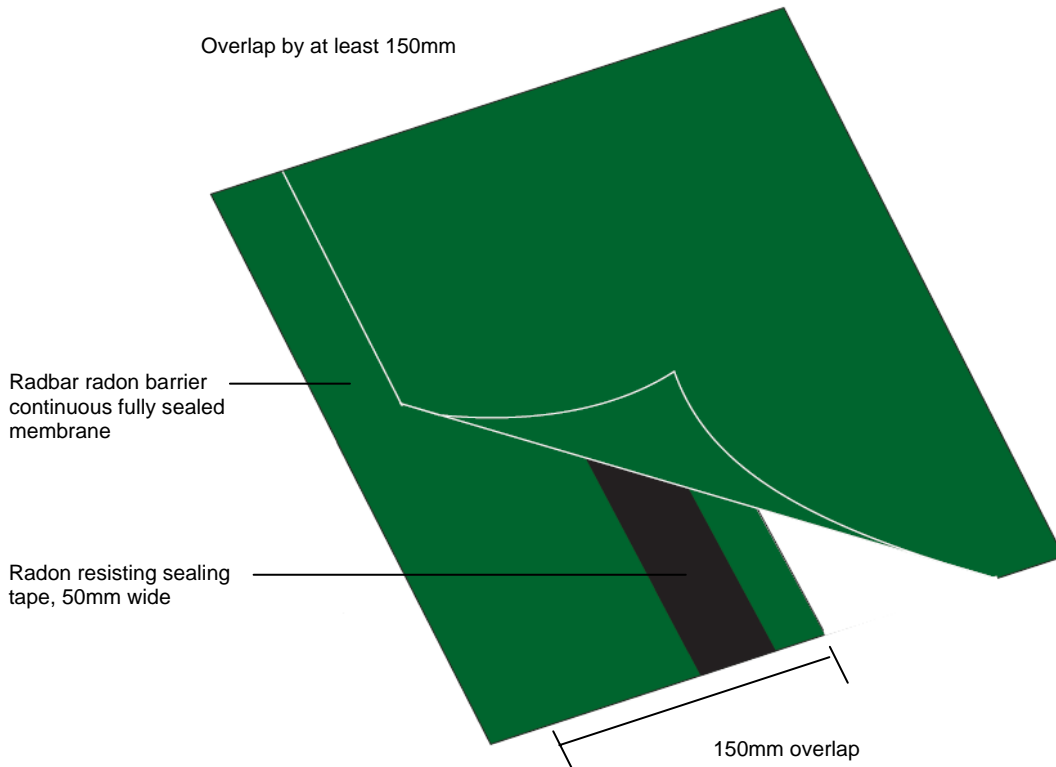
### 2.4.3 Procedure

Unroll one width of the membrane after determining the most effective method of covering the area. Apply the sealant tape about 50mm from the edge, leaving the backing paper on. Lay the next width of membrane overlapping the first by 150mm. Remove the backing paper from the sealant tape and join the top sheet to the bottom sheet by applying pressure with a hand roller (see Figure 1). When the weather is cold keep the sealant tape in a warm place until needed, and if necessary, apply a little hot air – never use a naked flame.

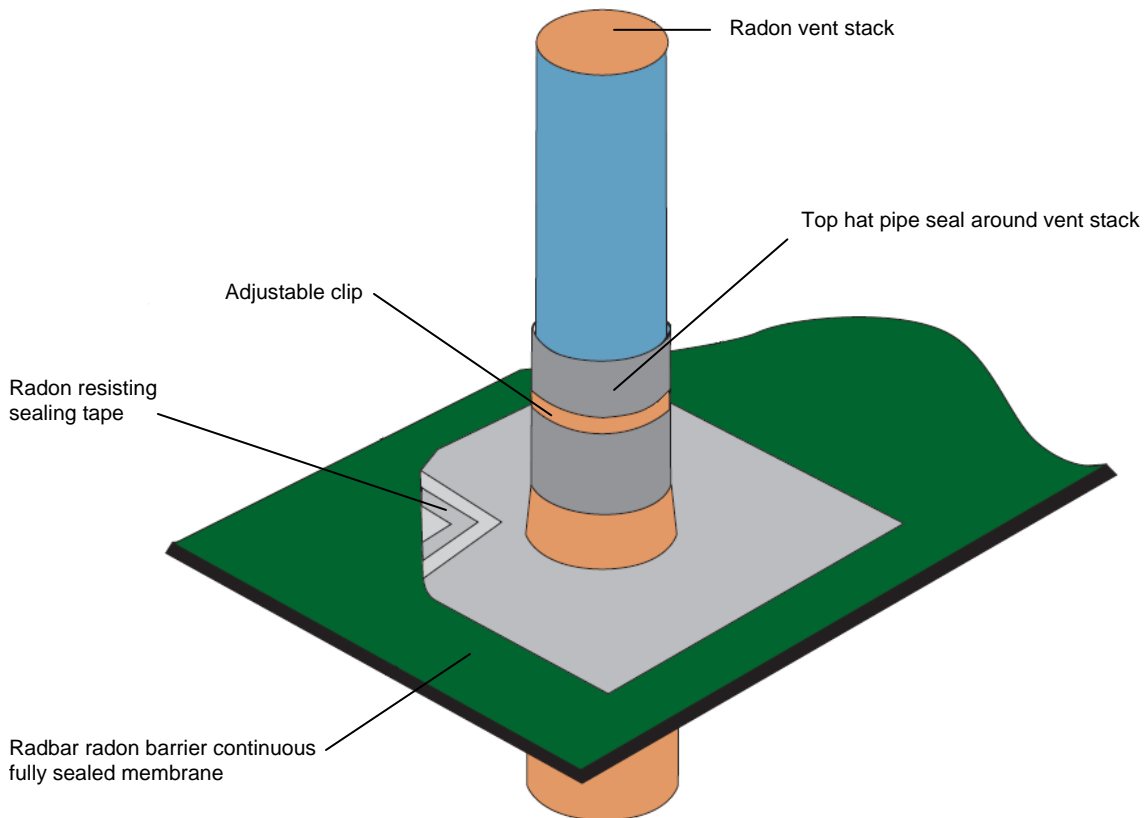
Where service ducts or pipes penetrate the membrane, all penetrations must be fully sealed. Gas tight joints are effected using radon resisting sealant tape and top hat units with retention clips (see Figure 4). Under site conditions, achieving gas tight seals can be difficult, for this reason it is recommended that Radbar be installed by appropriately trained personnel.

Pipes, steel stanchions, concrete columns etc. can be sealed using the approved adhesive bituminous gas resisting membrane with an overlap of 150mm on each surface and rolled firmly (see Figure 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.

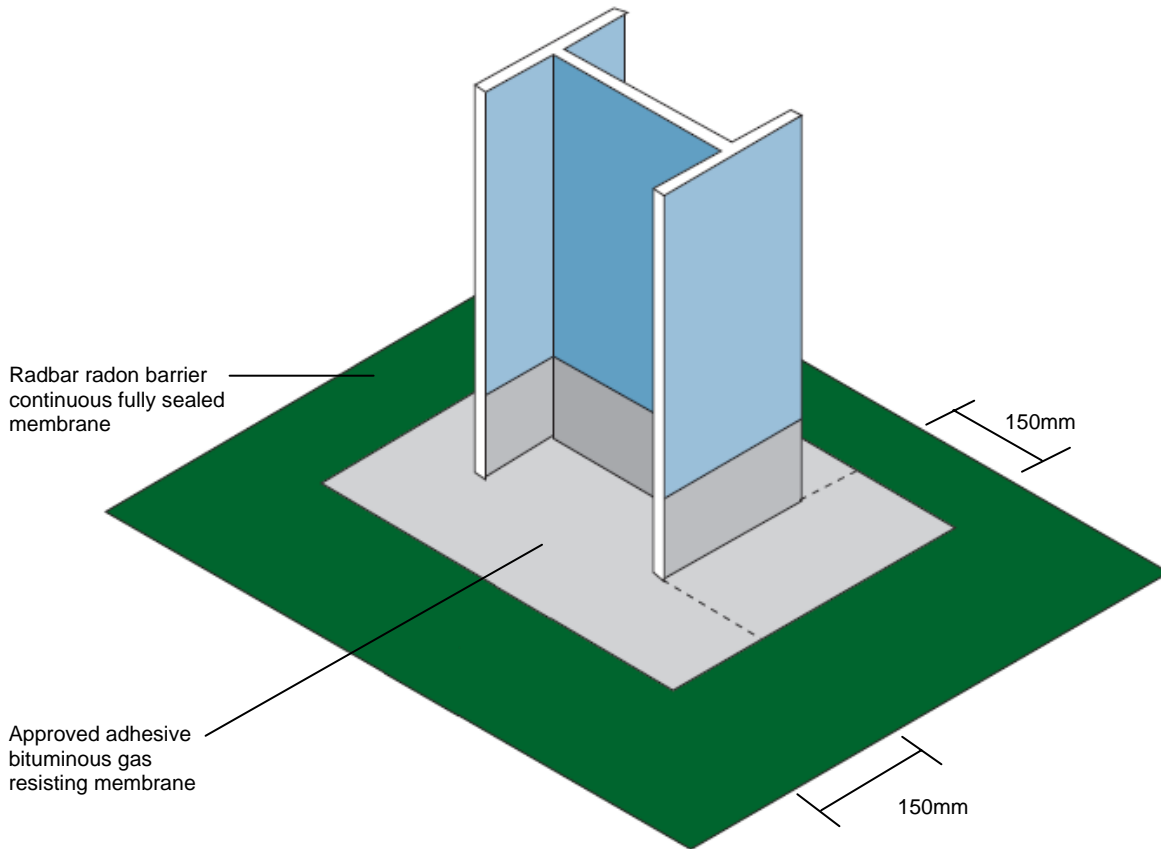
The membrane must be covered by a screed, high density insulation or other protective layer as soon as possible after installation/ Care should be taken to ensure that the membrane is not damaged, stretched or displaced when the screed or concrete floor is being poured, especially if the floor is to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



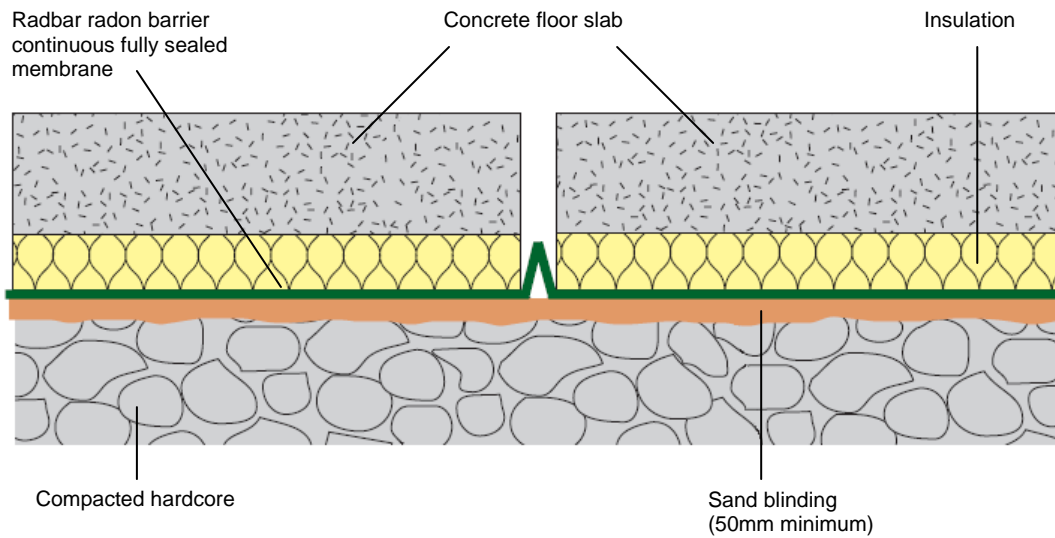
**Figure 1: Detail showing the overlap sealing of Radbar using radon resisting sealing tape**



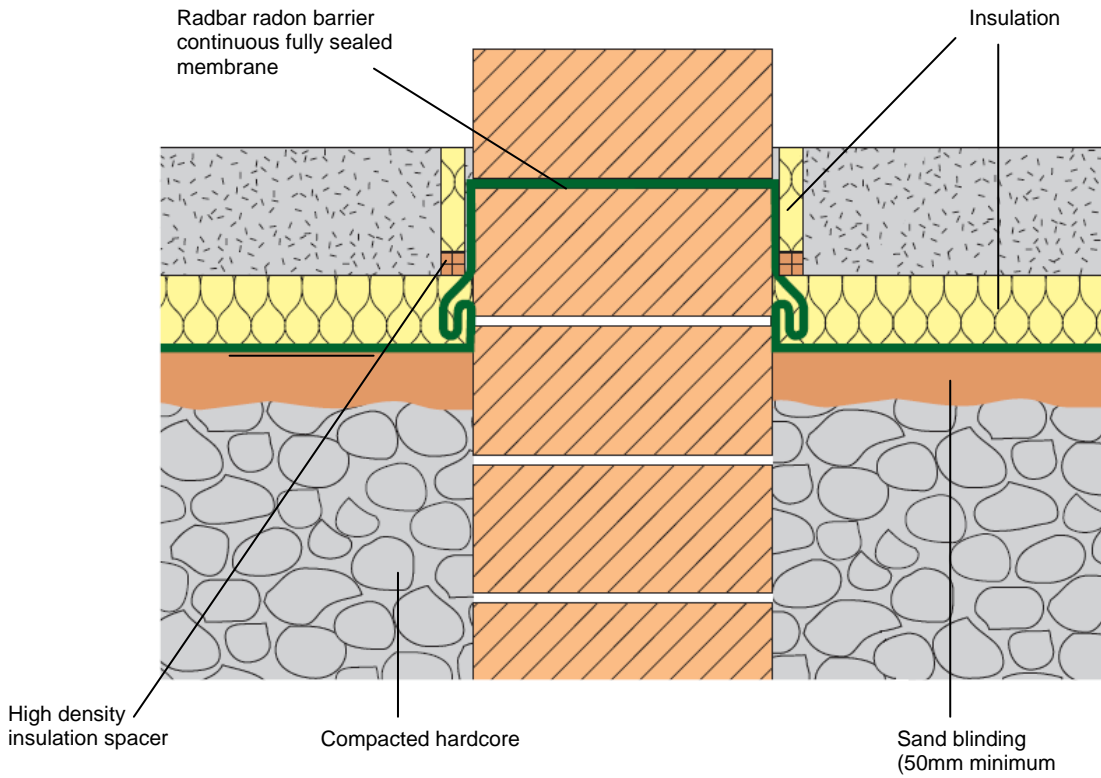
**Figure 2: Detail showing the sealing of a service duct or piper which penetrates Radbar**



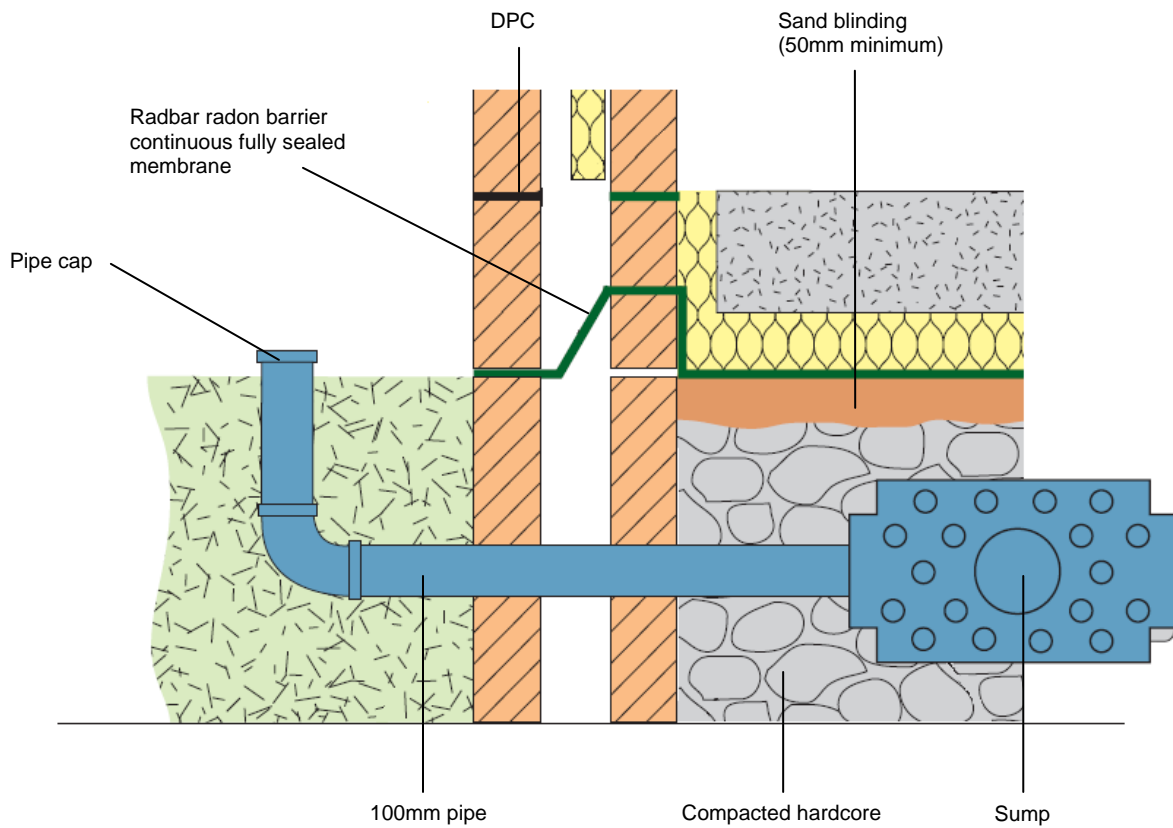
**Figure 3: Detail showing the sealing of a structural steel stanchion penetration seal**



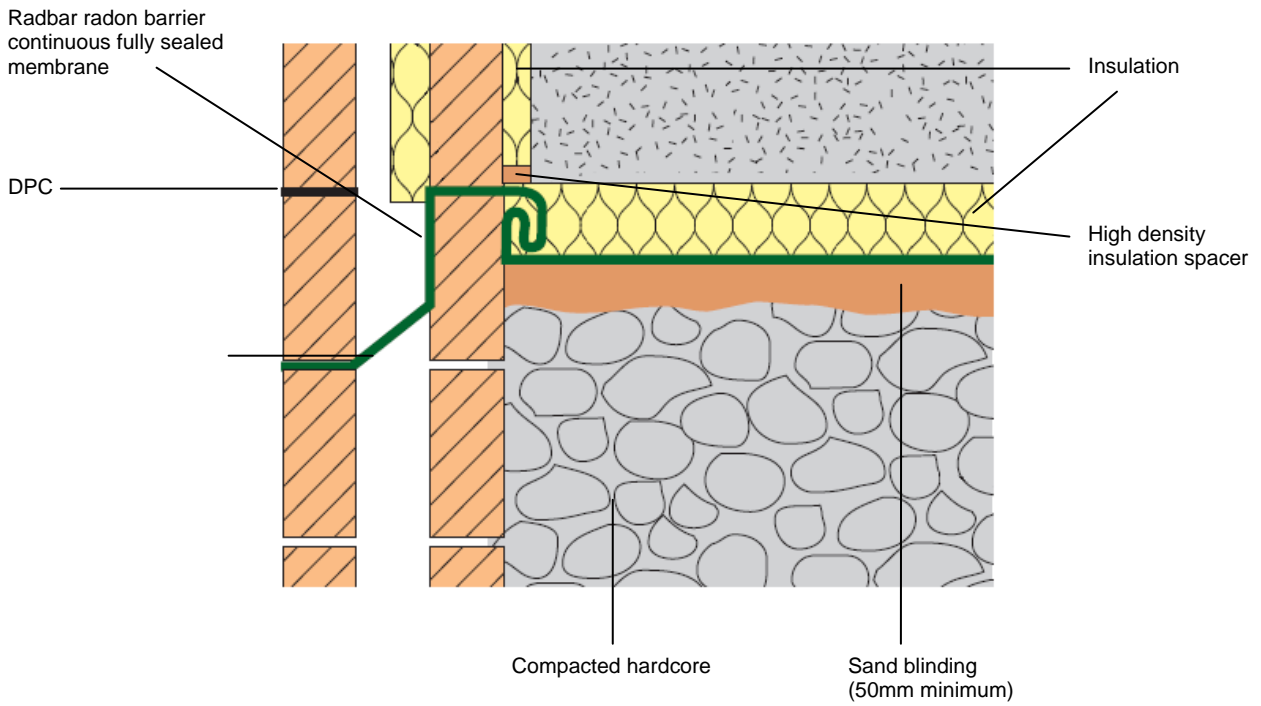
**Figure 4: Detail showing a movement control joint in a floor slab**



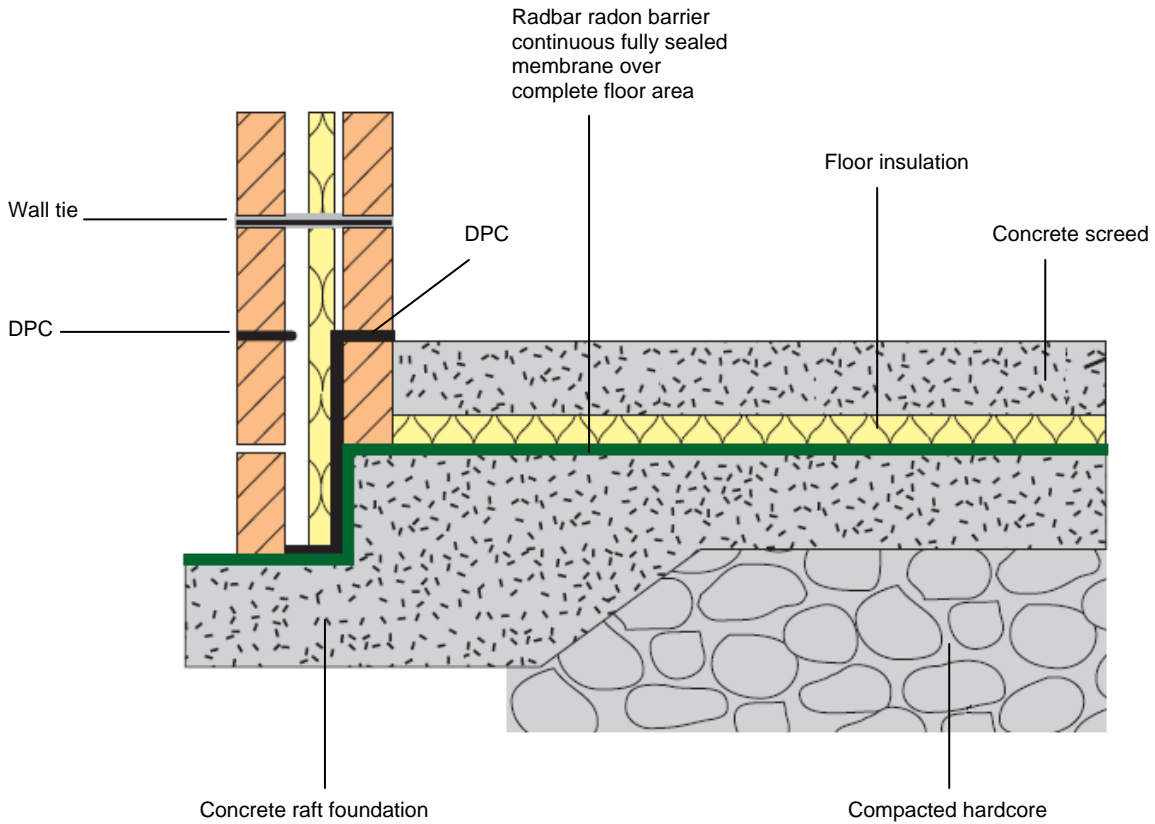
**Figure 5: Detail showing Radbar with folds at junctions with load bearing internal wall**



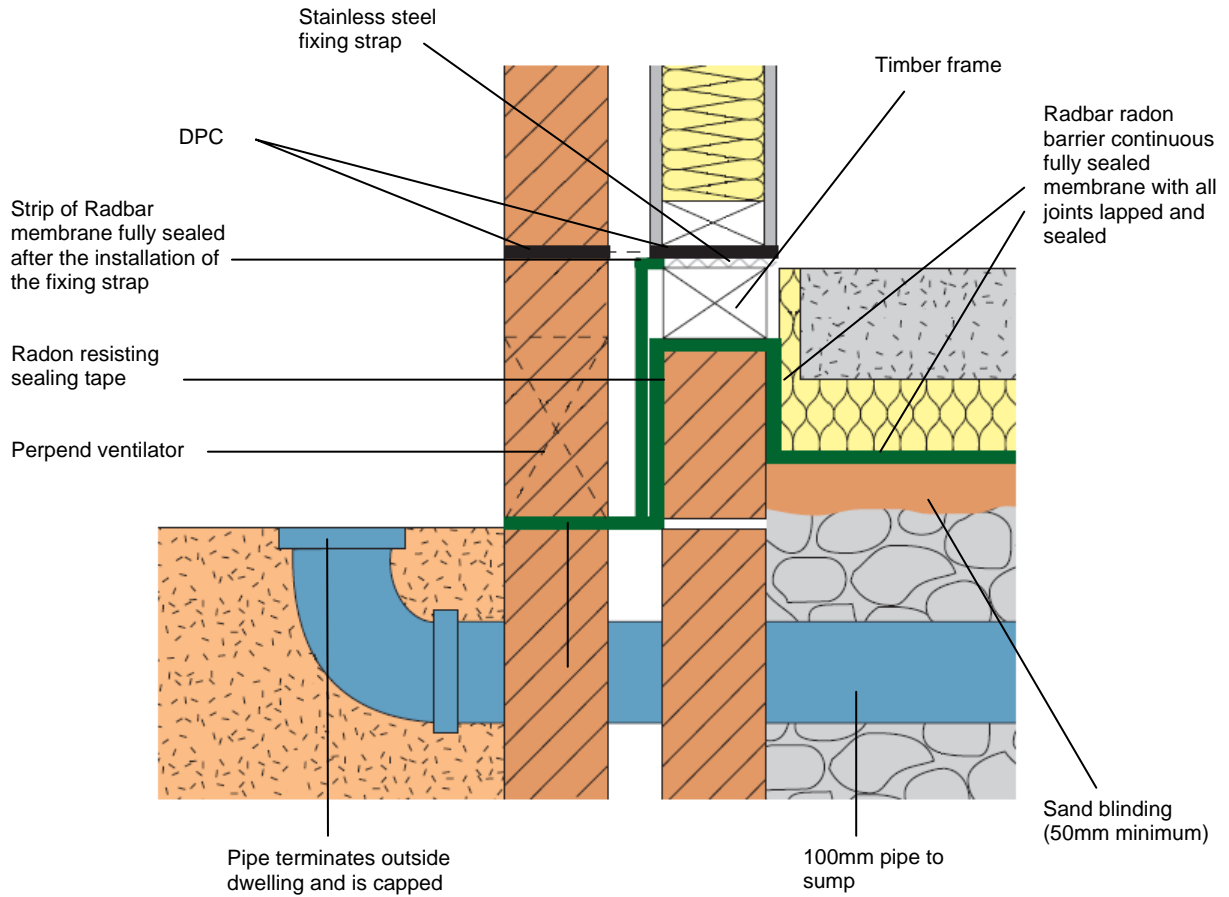
**Figure 6: Detail showing Radbar under floating slab with collection sump and vent pipe**



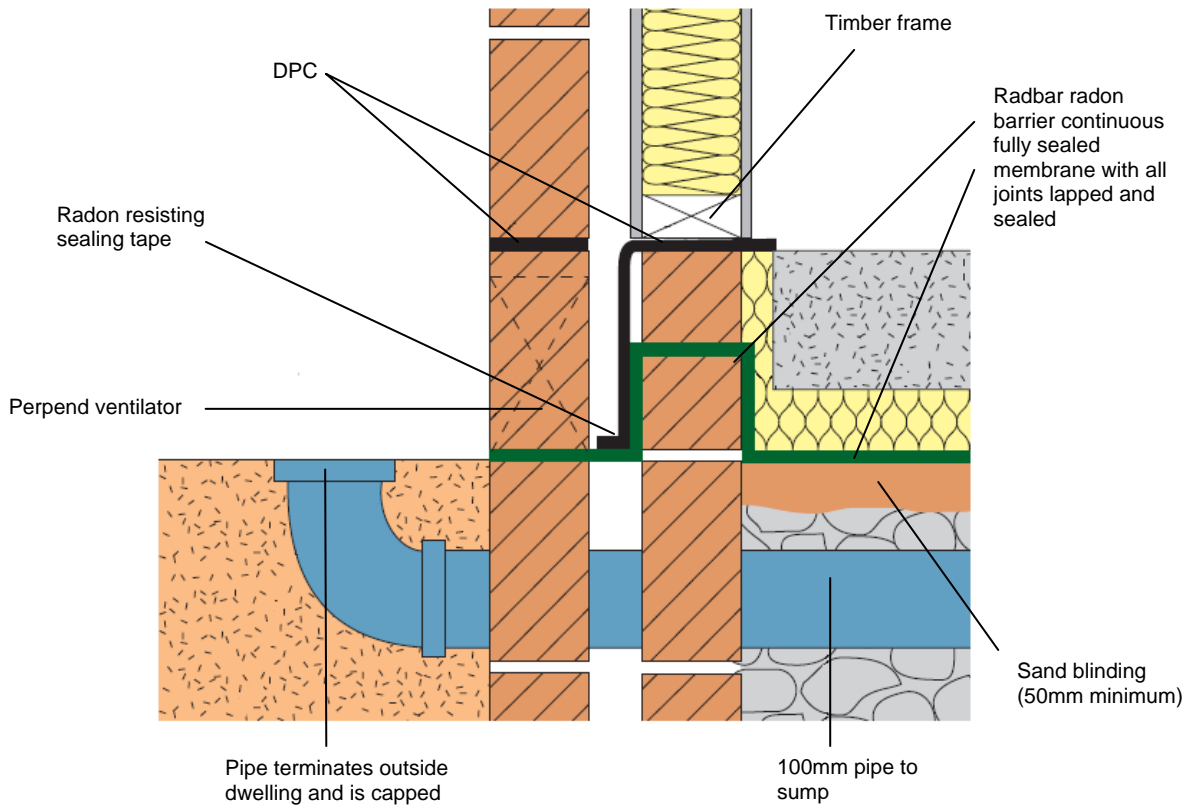
**Figure 7: Detail showing Radbar with folds under floating slab floor**



**Figure 8: Detail showing Radbar with raft foundation**

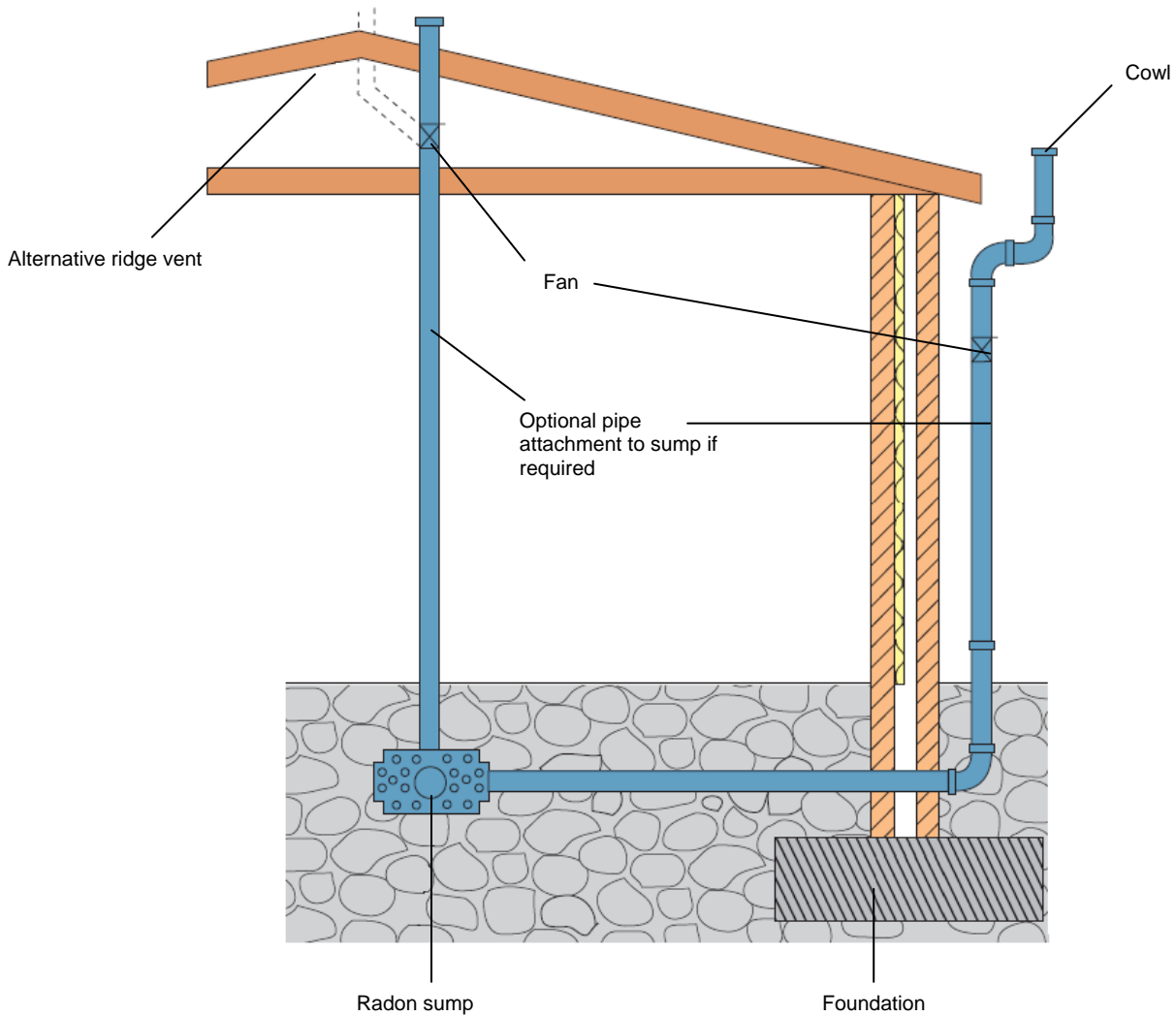


**Figure 9: Detail showing Radbar for timber frame construction (sole plate held in position with fixing straps)**



**Figure 10: Detail showing Radbar for timber frame construction (timber frame fixed directly to rising wall)**





(Fan connections only – Radbar radon barrier, screed insulation and sand blinding are not shown)

**Figure 11: Detail showing fan locations for the installation of an extraction system if required on the basis of subsequent radon level testing**

## CONSTRUCTION DETAILING – 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 cycle of a building, Radbar may be installed thus:



### 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, Radbar may be installed, with an upstand, thus:



### 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, Radbar should be installed, with folds, as shown here:



### 3.1 GENERAL

Radbar is suitable for use in concrete floors not subject to hydrostatic pressure, in accordance with the relevant clauses of IS 325-2:1995 and BS CP 102:1973.

The product is installed as an oversite membrane, either between a sand blinded compacted hardcore (50mm of sand minimum) bed and the base concrete, or between the base concrete and screed or laid on top of high density insulation ( $25\text{kg/m}^3$ ) with a concrete screed laid over it.

The hardcore used must be compacted with clean graded crush 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 membrane.

#### Resistance to radon, water and water vapour

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

#### Resistance to tear and puncture

The product has a high resistance to tear (see Table 1). Care should be taken during installation, particularly when handling building materials and equipment over the surface and when placing concrete or screeds, since the membrane can be punctured by sharp objects. When installed as set out in this Certificate, there should be minimum risk of puncture or tear damage. High density insulation ( $25\text{kg/m}^3$ ) is an effective protection after laying.

#### Site conditions

The system 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 325-2:1995 and BS 8102:1990.

#### Underfloor heating

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

### 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 325-2:1995);
- 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.

To aid radon gas dilution/dispersal:

- avoid downstand beams and limit number of rising walls beneath ground slabs which provide confined spaces for radon gas accumulation;
- maximise 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 the building.

Where special installation detailing is introduced, i.e. folding of a radon resisting membrane at critical construction points, an elongation capability for the membrane itself may not be required. Where high concentrations of radon are likely and where a building is properly designed, detailed and constructed to take account of settlement, the installation of Radbar radon offers 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 (refer Table 1).**

#### 4.1 TESTS / ASSESSMENTS

Technical investigations were carried out on Radbar. Typical results are shown in Table 1.

#### 4.2 MAINTENANCE

No maintenance of a radon resisting membrane is required when installed in accordance with this Certificate.

#### 4.3 DURABILITY

When installed in accordance with this Certificate and subject to normal conditions of use, the membrane 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 UV light can reduce the effectiveness of a membrane. However, during storage, 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 protection system must take into account the integrity of the radon resisting membrane.

#### 4.4 OTHER INVESTIGATIONS

(i) Existing data on product properties in relation to fire and toxicity were assessed. When stored with normal care on site prior to installation the membrane will not present a significant fire or health hazard.

(ii) 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.

(iii) Site visits were conducted to assess the practicability of installation.

**5.1** National Standards Authority of Ireland ("NSAI") following consultation with NSAI Agrément 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 for five years from date of issue so long as:

- (a) the specification of the product is unchanged.
- (b) the Building Regulations 1997 to 2008 and any other regulation or standard applicable to the product/process, its use or installation remains 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.

(f) the registration and/or surveillance fees due to NSAI Agrément are paid.

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

**5.3** In granting Certification, the NSAI makes no representation as to;

- (a) the absence or presence 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/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 2005, or of any other 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.

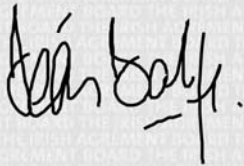
**5.7** Where reference is made in this Certificate to any Act of the Oireachtas, Regulation made thereunder, Statutory Instrument, Code of Practice, National Standards, manufacturer's instructions, or similar publication, it shall be construed as reference to such publication in the form in which it is in force at the date of this Certification.

## NSAI Agrément

This Certificate No. **03/0115** is accordingly granted by the NSAI to **Capital Valley Plastics Ltd.** on behalf of NSAI Agrément.

Date of Issue: **September 2003**

Signed



**Seán Balfe**  
Director of NSAI Agrément

**Revisions: September 2009**

- Change of thickness to 300µm.

Readers may check that the status of this Certificate has not changed by contacting NSAI Agrément, NSAI, 1 Swift Square, Northwood, Santry, Dublin 9, Ireland. Telephone: (01) 807 3800. Fax: (01) 807 3842. [www.n Sai.ie](http://www.n Sai.ie)