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BRE CERTIFICATION

CERTIFICATE NUMBER
100/03

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PRODUCT
POWERBASE RB
RADON RESISTANT MEMBRANES

SUPPLIED BY
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SUMMARY

Powerbase RB has been assessed to confirm its suitability for use when incorporated into the floor of a building to restrict the ingress of radon gas into a building in situations where there is a risk of contamination to the internal environment arising from radon evolution from the ground. It is supplied in two similar variants, RB 340 and RB 370 each comprising a reinforced polyethylene sheet membrane.

Powerbase RB and its method of application has been reviewed with respect to the Building Regulations current in the United Kingdom and the Republic of Ireland. The assessment has referred to British Standards and other publications current in October 2002.

The assessment is described in the following pages which form integral parts of this certificate.

LIMITATIONS OF USE

Powerbase RB is certified for use where a risk of radon contamination of a building exists.

Powerbase RB and the necessary components to complete the installation must be installed in accordance with the manufacturer's instructions and the requirements of this certificate. For buildings in the UK the recommendations of the BRE Limited Reports BR 211 (BR 376 in Scotland and BR 413 in Northern Ireland) "Radon : guidance on Radon Protective measures for new dwellings", and BRE 212 "Construction of new buildings on gas contaminated land" must be followed. Further guidance on detailing various constructions can be obtained from BR 414 "Protective measures for housing on gas contaminated land". In the Republic of Ireland reference should also be made to the Department of the Environment publication "Radon in Buildings".

The product is not intended for use in conditions where it may become subjected to hydrostatic pressure from the ground. Sub-soil drainage should be provided where there is a risk of the ground becoming waterlogged.

The product is primarily intended for use in normal ground conditions (4<pH<9). The product must remain protected from ultraviolet degradation and physical damage until immediately prior to use and once installed be covered as soon as practicable, but at the latest within two weeks.

Current information on the areas in the United Kingdom delineated by the Department of the Environment Transport and the Regions, with respect to the risk of radon infiltration levels for the purposes of the Building Regulations can be obtained from BR 211, BR 376 and BR 413). More up to date information may be available from local building control inspectors. In Ireland areas at risk of radon infiltration are designated in the Radiological Protection Institute of Ireland(RPII) publication "Radon in Irish Dwellings". This document is frequently updated and thus the latest version should be consulted. The tensile elongation of Powerbase RB is 8%. Specific provisions apply in the Republic of Ireland for constructions where a large degree of settlement is expected,(see section 2.4,below).

| [Powerbase](#) RB has not been assessed for resistance to methane. Contact with organic solvents and compounds and other hydrocarbons is to be avoided.

STATEMENT

It is the opinion of BRE Certification that Powerbase RB is satisfactory for use within the stated limitations provided that it is used in accordance with the manufacturer's instructions and the requirements of this certificate.

CONFIRMATION

For and behalf of BRE Certification

Technical Director

1. TECHNICAL SPECIFICATION

1.1 Description of Product

- 1.1.1 Powerbase RB is a laminated and cast extrusion coated reinforced LDPE sheet membrane which is white or other in colour. The two variants of the membrane have nominal weights of 0.34 and 0.37 kg/m² respectively with nominal thicknesses of 0.65 and 0.70 mm.
- 1.1.2 Powerbase RB is normally for supply in pre-fabricated panels assembled internally under dry conditions. It is also supplied in rolls for welding or jointing with tape on site, if necessary. It is for use in conjunction with proprietary ancillary products for sealing at penetrations by service pipes or ducts passing through the membrane into the building, allowing complete sealing over the footprint of the building.
- 1.1.3 The products characteristics of are listed in Table 1.

Product Characteristic	Nominal Value		
Length, m	50	25	25
Width, m	2.0	3.95 (folded to 2.0)	5.9 (folded to 2.0)
Roll weight, kg	38	38	57

1.2 Product Performance

- 1.2.1 These membranes, being greater than 1200 gauge (300 µm) thickness Low Density Polyethylene (LDPE) sheet, exceed the recommendation made in BRE Report BR 211 "Radon: guidance on protective measures for new dwellings" for an adequate radon resistant membrane.
- 1.2.2 Powerbase RB used with all joints lapped and sealed will restrict the ingress of radon into a building provided that it is installed in accordance with the manufacturer's instructions and the recommendations of this certificate. The membranes are for jointing by welding or taping in accordance with the manufactures instructions. Detailing at corners and service entries is carried out using propriety tape and ancilliary components. A high standard of workmanship is required to ensure maximum gastightness .
- 1.2.3 Powerbase RB can additionally 'double' as a damp proofing membrane.
- 1.2.4 Powerbase RB is considered to be adequately resistant to mechanical damage during the normal installation and construction processes provided no loads are placed on the material. The use of a super-imposed geotextile membrane should be considered if there is to be any trafficking. The membrane can be punctured by sharp objects. The integrity of the membrane must be checked prior to permanent covering and any necessary repairs carried out as described in Clause 3.3.11(below).
- 1.2.5 The Powerbase Radon Membrane must be covered by a screed of minimum thickness 50 mm if it is to be laid above the structural floor member. Where insulation is to be incorporated in a ground supported floor construction reference should be made to BRE Limited Report BR 262 "Thermal insulation: avoiding risks" regarding the positioning of the membrane.

- 1.2.6 For sites where the presence of gaseous contaminants are suspected, a site investigation should be carried out following the guidance of BS 10175. Further general information on site investigations is given in BS 5930.
- 1.2.7 Powerbase RB can be used as the primary protection measure in combination with either a suspended concrete floor with a ventilated subfloor void or a ground supported concrete floor. A high level of care must be exercised with detailing and joining and provision must be made for any anticipated settlement at junctions of structural elements. Guidance is given in BR 211, BR 376 and BR 411, which give further guidance on additional secondary protection measures such as subfloor depressurisation. In Ireland additional measures for protection from radon (subfloor depressurisation) in susceptible areas are indicated within DOELG Document "Radon in Buildings" as recommended in Technical Guidance Document C of the Republic of Ireland Building Regulations.
- 1.2.8 Powerbase Radon Membrane should retain its performance for the normal design life of standard floor constructions into which it is incorporated provided it has been installed in accordance with the manufacturer's instructions and the provisions of this certificate.

2. BUILDING REGULATIONS

The relevant Building Regulation requirements for these products are:

2.1 The Building Regulations (England & Wales) 2000 (as amended)

Requirement

- A1 Loading - the Powerbase Radon Membrane will safely and without undue deformation sustain and transmit the dead and imposed service loads to the floor slab.
- C2 Dangerous and offensive substances - the installation of Powerbase Radon Membrane within the system is considered to be an acceptable precaution to limit the danger to health and safety caused by the permeation of radon from the ground.
- C4 Resistance to weather and ground moisture - when installed in walls and floors in accordance with Section 3.3 of this certificate, the Powerbase Radon Membrane within the system will adequately resist the passage of moisture to the inside of the building.

Regulation

- 7 Materials and workmanship - the Powerbase Radon Membrane is manufactured from appropriate materials for the application in which it is intended to be used and can be installed satisfactorily.

2.2 The Building Standards (Scotland) Regulations 1990 (as amended)

Regulation

- B2.1 Selection and use of materials - the Powerbase Radon Membrane is comprised of suitable materials for a radon and moisture retarding membrane.
- C2.1 Construction - the Powerbase Radon Membrane will safely and without undue deformation sustain and transmit the dead and imposed service loads to the floor slab.
- G2.1 Preparation of a site - when installed in accordance with Section 3.3 of this certificate, the Powerbase Radon Membrane within the system will contribute to the safety of the building by limiting the effects of radon.

G2.6 Resistance to moisture from the ground - when installed in a floor or wall in accordance with Section 3.3 of this certificate, the Powerbase Radon Membrane within the system will prevent moisture from the ground reaching the inner surface of any part of the building which it could damage.

2.3 The Building Regulations (Northern Ireland) 2000

Regulation

- B2 Fitness of materials and workmanship - the Powerbase Radon Membrane is manufactured from materials of a suitable nature for the intended purpose and can be installed so as to limit the danger to the health or safety of persons in or about the building.
- C2 Preparation of site - when installed in accordance with Section 3.1 of this certificate the Powerbase Radon Membrane within the system will contribute to the safety of the building by limiting the effects caused by radon.
- C4 Resistance to ground moisture and weather - when installed in a wall or floor in accordance with Section 3.1 of this certificate, the Powerbase Radon Membrane within the system will prevent the passage of moisture to any part of the building from the ground.
- D3 Stability - the Powerbase Radon Membrane will safely and without undue deformation sustain and transmit the dead and imposed service loads to the floor slab.

2.4 The Building Regulations 1997 Republic of Ireland (as amended)

Requirement

- A1 Loading – Powerbase Radon Membrane will safely and without undue deformation sustain and transmit the dead and imposed service loads to the floor slab.
- C3 Dangerous and offensive substances – the installation of Powerbase Radon Membrane within the system is considered to be an acceptable precaution to limit the danger to health and safety caused by the permeation of radon from the ground.

The technical guidance document must be consulted to determine what limitations apply with regards to restriction of movement by design and the permitted method of installation.

- C4 Resistance to weather and ground moisture – when installed in walls and floors in accordance with Section 3.3 of this certificate, Powerbase Radon Membrane will adequately resist the passage of moisture to the inside of the building.
- D2 Materials and workmanship - Powerbase Radon Membrane is manufactured from appropriate materials for the application in which it is intended to be used and can be installed satisfactorily.

3. INSTALLATION/PRACTICAL APPLICATION

3.1 Identification

- 3.1.1 Powerbase Radon Membrane is supplied in rolls as listed in Table 1. Each roll is secured by circumferential tapes displaying the manufacturer's name and product identification. The roll weights are listed in Table 1.

3.2 Storage and Handling

- 3.2.1 Rolls of Powerbase Radon Membrane should be securely stacked on site preferably under cover and protected from accidental damage. The rolls must not be stored on their ends. The Powerbase ancilliary components should be protected from rain, frost and exposure to sunlight during storage. It should be ensured that the temperatures of these materials does not fall below 5°C or exceed 30°C at any time.

Care should be taken when handling these materials on site in order to avoid accidental perforation. If repairs are required they must be carried out as stated in Clause 3.3.11,(below).

3.3 Installation

- 3.3.1 Powerbase Radon Membrane must be installed in accordance with the manufacturer's written instructions, and must be installed in accordance with the recommendations of British Standard Code of Practice CP102 (and IS 325:Part 2 in the Republic of Ireland). In all cases the workmanship must meet the requirements laid down in BS 8000:Part 4 taking sufficient care to ensure sealing over the whole footprint of the building. The quality of the installation work is critical to the final performance of the Powerbase RB radon membranes. Only trained and skilled operatives of competent contractors, who are familiar with ITP's installation instructions should carry out the work.
- 3.3.2 The radon protection must be made continuous through the external walls and internal walls of the building traversing any cavities. For cavity walls the membrane should form a cavity tray stepped down towards the outer leaf, as is normal practice with cavity trays, with the sealing of the overlaps continuing across the cavity. The membrane should be supported across the cavity by filling to the level of the membrane with mortar.
- 3.3.3 Where the membrane is to be used for ground supported slab applications, provisions must be made for any anticipated movement of the slab during the life of the building(determined from a prior site investigation) to ensure that the membrane integrity is not compromised.
- 3.3.4 Surfaces which are to receive Powerbase Radon Membrane should be prepared to avoid any damage to the membrane occurring. If the surface is a concrete slab or masonry surface it should have a smooth clean and dry finish free of projections or indentations. If it is intended to lay Powerbase Radon Membrane on to sand blinding, this must be of sufficient thickness to cover all sharp projections and be tamped flat.
- 3.3.5 Installation of Powerbase RB must be over prepared ground or sub-floor. When the membrane is to be installed below a suspended concrete slab it should be loosely laid to accommodate any small movements that may occur subsequent to installation.
- 3.3.6 The membranes can be prefabricated by welding to suit each application. Welding can also be carried out on site according to the manufacturer's instructions provided conditions are suitable. The membrane must be clean and dry and the temperature above 5^o C. A test sample should be welded prior to welding the installed membrane to confirm that a satisfactory joint has been achieved. For the joint a 'tape' weld, not lapped weld, is made with a heavy duty tape coated fabric e.g. Powerlene TP 280. When installing welded panels the tape welds should be on the underside of the panels (see Figure 1).

- 3.3.7 Where joints are to be made with adhesive tape all surfaces must be dried thoroughly to ensure adequate adhesion prior to the application of the bonding tape. The joint should then be consolidated, preferably by firm rolling with a roller. Continuity of the membrane must be maintained at all positions and corners and all gaps sealed. A 50 mm wide adhesive tape must be used to cover the edge of each sheet.
- 3.3.8 The surface of the components to be joined either by welding or taping must be free of any mortar droppings, loose matter, grease or other deleterious substance.
Jointing of components must not be carried out below 5°C and some warming with a hot air gun may be required between temperatures of 5 and 10°C to ensure a satisfactory seal. Any self-adhesive primer used must not be applied to surfaces at or below 5°C.
- 3.3.9 It must be ensured that no bridging by the membrane should be allowed to occur at internal corners where concreting is to be carried out; the membrane should be laid sufficiently loosely so that it is not stretched or torn.
Where sharp corners are unavoidable, internal and external angles must be strengthened with a 300 mm wide strip of membrane fixed as appropriate and interleaved with the adjacent layers of membrane.
- 3.3.10 In order to ensure the continuity of the membrane, it will be necessary to construct an airtight seal around all service entry points and features such as structural columns. Proprietary 'top-hat' units should be used for sealing around pipe entries. It should be noted that any gap between the inside of any service duct and an encased service pipe or cable should also be sealed preferably with a minimum of 150 mm depth of cold applied sealant. Service entry points should not be coincident with lapped joints in the membrane. Sealing to steel or concrete structural columns must be accomplished using self-adhesive sheet. All concrete surfaces to receive the self-adhesive sheet must be primed with the sheet manufacturer's designated primer.
- 3.3.11 Where the membrane is to be laid over, for example, a slab movement joint it should be loosely folded back on itself during laying.
- 3.3.12 Powerbase Radon Membrane and ancillary components must be protected from site damage immediately that installation work is completed. Before the permanent protection is placed, the membrane area must be inspected for defects which should be repaired with an overlay of membrane extending beyond the point of damage by a minimum of 150 mm in all directions and securely taped in position.

4. TECHNICAL APPRAISAL

4.1 Performance Tests

Tests and investigations have been carried out by BRE Certification to determine the properties of the Powerbase Radon Membrane to include:-

- thickness
- weight per square metre
- tensile strength
- dimensional stability
- tensile strength before and after heat ageing
- water penetration resistance
- resistance to cracking at low temperature

Typical technical data for the membrane is presented in Table 2.

4.2 Quality Control

The Powerbase Radon Membrane is manufactured under a quality system independently assessed to BS EN ISO 9001. The supplier carries out quality control tests and inspections to ensure that the finished products conform to the Powerbase RB products specification.

Traceable quality records are maintained by the manufacturer. In the opinion of BRE Certification the materials and procedures of the manufacturer are adequate for the product.

4.3 British Standards

The following British Standards and other standards have been referred to for this assessment:-

BS 2782:Part 3:1977(1983)	Methods of testing plastics. Methods 326A to 326C. Determination of tensile strength and elongation of plastics films.
BS 2782:Part 3:1991	Methods of testing plastics. Method 360B. Determination of tear resistance of plastics film and sheeting by the trouser tear method.
BS 3177:1959 (1995)	Method for determining permeability to water vapour of flexible sheet materials used for packaging.
BS 5628:Part 3:1985	Code of practice for use of masonry. Materials and components, design and workmanship
BS 5930:1981	Code of practice for site investigations
BS 6515:1984(1996)	Specification for polyethylene damp proof-courses for masonry
BS 6399:Part 1:1984	Loading for buildings. Code of practice for dead and imposed loads
BS 8000:Part 4:1989	Workmanship on building sites. Code of practice for waterproofing
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
CP102:1973	Code of practice for protection of buildings against water from the ground
BS 10175:1988	Code of practice for the identification of potentially contaminated land and its investigation.
IS 325:Part 2:(1995)	Code of Practice for the use of masonry. Masonry Construction.

The following Union Européenne Pour L'Agrément Technique Dans La Construction (UEAtc) document has been referred to for this assessment:-

MOAT 27	General Directive for the Assessment of Roof Waterproofing Systems
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BR 211 (BR 376 in Scotland and BR 413 in Northern Ireland) Radon : guidance on Radon Protective measures for new dwellings.

BR 212 Construction of new buildings on gas contaminated land

5. CONDITIONS OF CERTIFICATE ISSUE

5.1 Validity

This certificate will be valid for a period of three years. It will remain valid in so far as:

- a) The materials and method of manufacture are unchanged.
- b) The design and specification are unaltered from those examined by BRE Certification.
- c) Industrial Textiles and Plastics continues to have the product regularly checked by BRE Certification.

5.2 Health and Safety

This certificate and the recommendations herein do not purport in any way to restate the requirements of the Health and Safety at Work Act 1974 or any statutory or common law duty of care which exists now or in the future; nor is compliance with these recommendations to be assumed as satisfying the requirements of the said Act or any existing or future statutory or common law duty of care.

5.3 Reference to Other Documentation

Where reference is made in this certificate to any Act of Parliament, Regulation, Code of Practice, British or other Standard or other publication, it shall be construed as reference to such publication in the form in which it is in force at the date of the certificate.

5.4 Patents

BRE Certification makes no representational warranty that any patent or similar industrial property right is valid or that the manufacture, use, sale, lease or any other dealing or disposition of the product in whole or in part is not an infringement of any patent or industrial property right not owned by Industrial Textiles and Plastics.

TABLE 2 Typical Technical Data for Powerbase RB

Property	Test Description	Result
Dimensions(nominal)		Thickness (overall) 0.65 and 0.7 mm
Mass (nominal)	BS EN 1849-2	0.34 and 0.37 kg/m ²
Tensile elongation(1)	ISO 1421	Elongation(at max load) 8%
Resistance to tearing(1)	Nail tear	Resistance 399 N
Resistance to passage of water vapour	Water vapour permeability, DIN 53122-1	Permeability 0.06 g/m ² /24h
Resistance to passage of Radon	Equivalence to 1200 gauge LDPE	Minimum Thickness LDPE 0.3mm
Water penetration resistance	EN 1928	Leakage None
Low temperature flexibility	Flexibility on unrolling MOAT 27(5.4.2)	Condition of Membrane No fracture -20 °C

Footnotes

1. Results quoted for these tests are the minimum value obtained with test-piece taken from either the longitudinal, or the transverse, roll alignment.