

POWERBASE®

Vapour and Gas Barrier Solutions

Green, Amber, 1, 2 and Red Gas Protection Measures

Installation Instructions

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HIGH PERFORMANCE BARRIER MEMBRANES

Effective protection against CO₂, Radon, Methane, Hydrocarbons & VOCs

1 INTRODUCTION













Powerbase vapour and gas barriers provide protection against naturally occurring hazardous gases and soils contaminated with hydrocarbons or toxic industrial pollutants. They are also used for groundwater and environmental protection installations.

Gas barriers are necessary wherever there is a risk of naturally occurring radon or methane gas. Radon is commonly found over granite formations whereas methane and carbon dioxide is produced as a result of the decomposition of organic matter such as made ground or natural deposits such as coal, peat or silt.

Developments on brownfield sites such as old industrial sites or contaminated land require effective gas barriers to prevent harmful gases, hydrocarbons and Volatile Organic Compounds (VOCs) from permeating into buildings.

Typically, an impermeable barrier is designed in the foundations of the building over a high permeable ventilation layer. Hazardous gases and VOCs migrate up through the soil and collect under the membrane in a sump from where they are vented and safely dispersed into the atmosphere.

The principal function of the gas barrier membrane is to prevent harmful gases from entering the building through cracks, construction joints and service openings in the floor slab. The membrane should cover the whole plan area of the structure to all external faces in order to seal the ground slab as well as any cavity walls and voids in hollow concrete block work.

Protection	DPM	Radon	Methane	CO ₂	Hydro-carbons	VOCs
POWERBASE® VOC	 NHBC Green	 NHBC Amber 1	 NHBC Amber 2	 NHBC Amber 2	 NHBC Red	 NHBC Red
POWERBASE® MULTIGAS	 NHBC Green	 NHBC Amber 1	 NHBC Amber 2	 NHBC Amber 2	NOTE Aluminium laminate gas barrier membranes are unsuitable in soils contaminated by hydrocarbons or VOCs due to a risk of delamination.	
POWERBASE® RADON	 NHBC Green	 NHBC Amber 1				

Special consideration should be given to sites contaminated by Hydrocarbons or VOCs. These are very mobile compounds and will migrate relatively easily through unsuitable membrane materials. Aluminium laminates are superb gas barriers but these materials will delaminate when exposed to hydrocarbon vapour/VOCs; furthermore, the aluminium layer is susceptible to oxidation due to moisture penetrating the exposed edges. A comprehensive range of task-specific engineered barriers and accompanying Accessories provide consultants and design engineers effective barrier solutions and for the contractor a rapid, simple and cost-effective installation.



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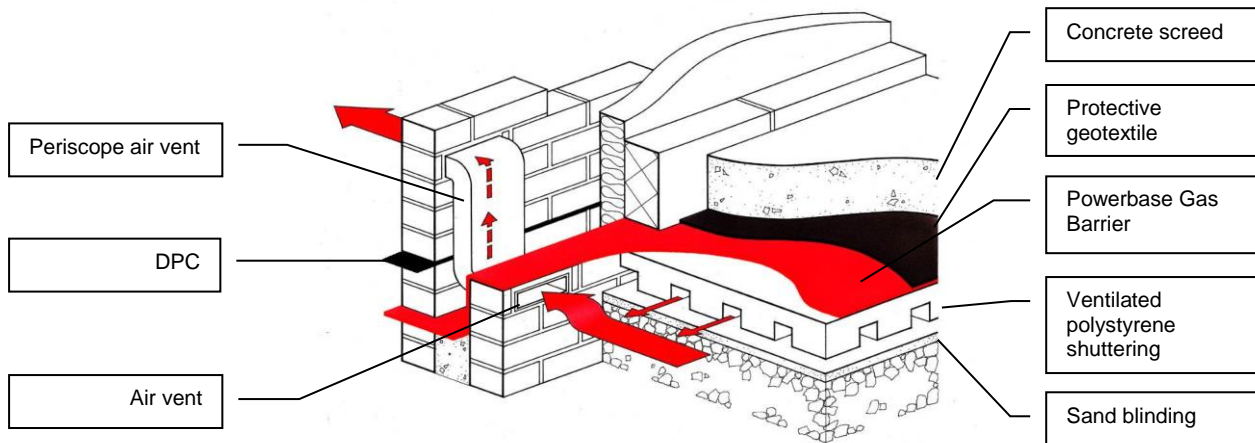
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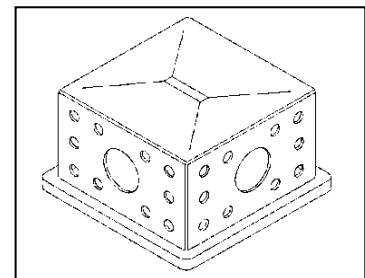
2 DESIGN DETAILS



- 2.1 **Continuity** - Powerbase Barrier membranes should be continuous over the whole floor plan area of the structure and stepped down across the cavity. Cavity walls, voids formed in hollow concrete block walls etc. should be sealed to avoid gas accumulating in them.
- 2.2 **Protection** - The membrane should be adequately protected on both sides throughout the installation and construction phases. The underside of the membrane should not be laid directly onto a granular fill, should there be any chance of sharp object or debris a sand blinding layer of minimum 50mm may be required, alternatively a geotextile layer.
- 2.3 **Pre-fabricated panels** - Powerbase Barrier membranes are normally supplied in rolls or pre-fabricated panels welded under factory controlled conditions.
- 2.4 **Service penetrations** - Service penetrations should enter the building above the sealed floor slab. Where this is not possible, penetrations should be kept to a minimum. Where services need to penetrate the membrane, Top Hat gas tight seals are required around each point of entry.
- 2.4.1 Pre-fabricated Top Hats can be supplied or made-up by the installer.
- 2.4.2 Top Hats should be dressed with a sealing tape to seal to the pipework and to the underlying Powerbase Gas Barrier membrane.
- 2.4.3 Where applicable, soap bars should be positioned on the inside cavity wall blocks so that timber frame constructions do not puncture the membrane.

Comprehensive CAD drawings, product data sheets, technical briefing documents, case studies and MSDS/COSHH safety information are available on our website (Registered Users) or by contacting our Technical Department.

- 2.5 **Internal walls** - All internal walls must finish level with the sand blinding to allow the membrane to continue across the complete floor area without site welding. The internal load bearing and other walls can be built on top of the radon membrane directly above the rising walls from the foundation which will also help as a floor screed on the concrete base.
- 2.6 **Gas exhaust system** - Exhaust systems should be designed as follows: For every 200 m² of floor space, a sump should be placed as close as possible to the centre of the construction. Sumps should be located centrally beneath the floor slab during the construction and surrounded by clean permeable aggregate.
- 2.6.1 All pipework must be sealed. Pipework should be 110mm and clearly identified so that it is distinguishable from all other pipe systems.
- 2.6.2 In order to minimise any condensation, the exhaust pipework should rise from the sump. It should connect to a loft-installed vent through perimeter elbows or cavity wall adapters and a vertical vent pipe.



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2.6.3 For safe and effective dispersal of radon, the terminating pipework should be positioned on the roof ridge or above eaves level and no less than 600mm from any roof opening.

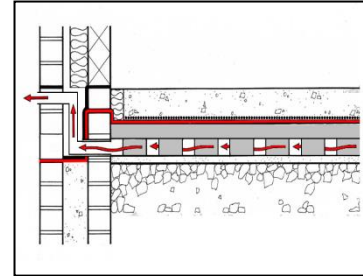
2.6.4 If the vertical vent pipe is to be positioned on the outside of the building, a cavity wall adapter is necessary to connect the exhaust pipework to the rising exhaust pipe.

2.7 **Gas dispersal system – Ventilated polystyrene shuttering design** Ventilated polystyrene shuttering is the recommended dispersal design. The reasons are:

- superior ventilation
- multi-directional airflow
- improved thermal insulation
- savings on aggregate fill

2.7.1 The exhaust vent may be fitted to the external wall or extended to the roof. It should connect to a loft-installed roof vent through perimeter elbows or cavity wall adapters and a vertical vent pipe. For safe and effective dispersal of methane, the terminating pipework should be positioned above eaves level and no less than 600mm from any roof opening

2.7.2 All methane pipework above the barrier should be solvent sealed. Solvents must not be allowed to contact the barriers or sealing materials.



2.8 **Other dispersal systems**

2.8.1 Ventilated geocomposite design – Ventilated geocomposites are an alternative dispersal method. However they are generally unidirectional and have a slower airflow rate.

2.8.2 Perforated pipe design – A further system is the installation of a series of perforated flexible pipes placed within clean course aggregate. The perforated pipes connect to air vents installed in the external walls. The principal disadvantage to this system is the limited access for gas to enter the perforated pipework.

3 SEALING AND JOINTING

3.1.1 Powerbase barrier membranes are preferably welded but can also be taped. Methodology is detailed in Section 6 under Installation.

3.1.2 For taped jointing, the following tapes are applicable:

- a) 30mm Powerbond Double-sided jointing tape for overlaps;
- b) 75mm Powerbond Single-sided sealing tape for sealing edges;
- c) 75mm Powerbond Single-sided sealing foil tape for Methane protection installations;
- d) 300mm Powerbond Single-sided detailing foil tape for corners and detailing.

3.2 **Slip planes** - Careful consideration of the detailing of the Powerbase Gas Barrier membrane should be undertaken to avoid the creation of slip planes in construction.

3.2.1 If the Powerbase Gas Barrier membrane is separate to the damp proof course (DPC) the two membranes should be joined in such a way so as not to affect the frictional resistance of the DPC.

3.2.2 Powerbase Gas Barrier does not require a separate damp proof membrane (DPM) to be installed.

3.3 **Method** – Powerbase Gas Barrier installation is similar to that of a Damp Proof Membrane (DPM) but with greater emphasis on attention to detail and workmanship in order to provide an effective gas-tight system.

3.3.1 It is not intended wherever there is a risk of hydrostatic pressure.

3.4 **Composition** – Powerbase Gas Barriers are chemically inert and unaffected by mild acids and alkalis found in soils. It does not rot or support mildew or other organic growth.



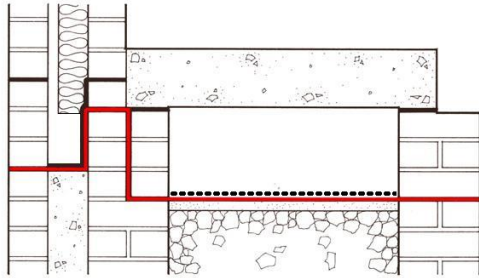
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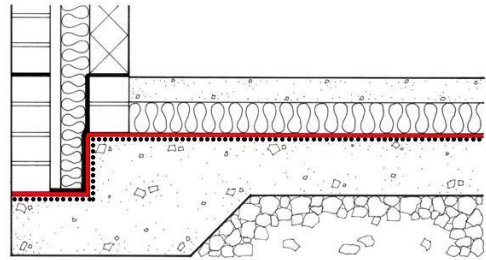
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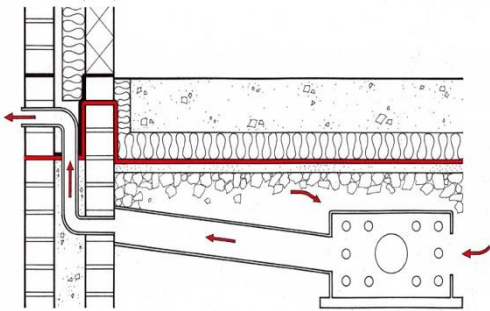
4 TYPICAL ARRANGEMENTS



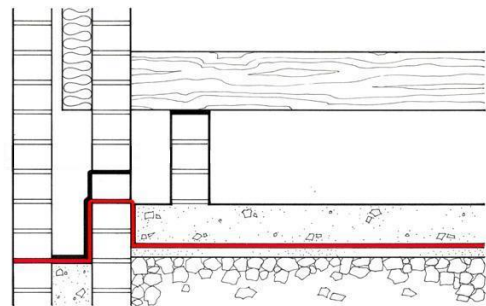
Suspended concrete floor



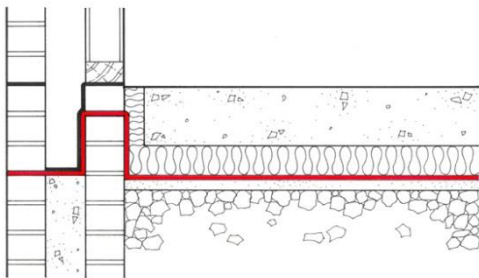
Raft foundation



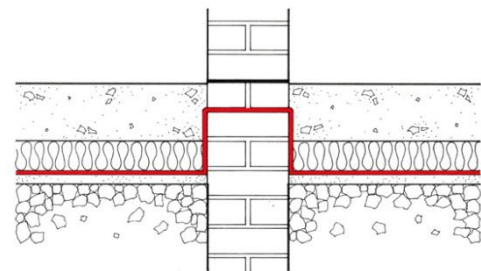
Masonry cavity wall



Suspended timber floors



Timber frame construction



Party walls



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5 INSTALLATION

Installation should be performed in conjunction with the design details.

- 5.1 **Quality control** - Adequate quality control is very important when laying a membrane to ensure that no damage occurs. Membranes should be laid before any internal walls are built.
- 5.2 **Storage and handling** – Powerbase Barriers should be stored inside in cool and dry conditions, away from direct sunlight. It should be handled with care to avoid any scuffing or puncturing. When installed, the barrier should not be exposed to sunlight or weathering for prolonged periods. In colder periods the barrier becomes less supple and installations should be avoided whenever site temperatures fall below 5° C.
- 5.3 **Protection** - Membranes should be protected from overlying trades by the use of protection boards or sheeting over the whole area, or by intermediate laying of the upper slab or floor screed.
- 5.4 **Continuity** - Panels should be installed on a layer of level sand or concrete blinding across the whole floor area. Whilst pre-fabricated panels are normally supplied, continuity of membranes can be achieved by joining separate membrane panels or rolls by welding or taping. Welding is the preferred methods since it provides a stronger joint.
- 5.5 **Ventilated polystyrene shuttering** – Where installed, ventilated polystyrene shuttering panels should be installed on a layer of level sand or concrete blinding across the whole floor area. The shuttering panels should be cut neatly around all service ducts and pipework penetrating the floor slab.
- 5.6 **Joining of rolls and panels** - Joins should only be made where the barrier is supported (i.e. not where the join bridges unsupported areas). Rolls or panels may be joined by either welding or taping as follows:
 - 5.7 **Welding panels** – Welding should only be performed by a competent and experienced installer. Membranes should be clean and dry, free of any dirt, condensation, grease and other contaminants.
 - 5.7.1 When welding Powerbase Gas Barrier membranes by thermal fusion or melt bonding, the degree of heat and level of pressure applied needs to be carefully controlled. Too little heat results in poor seam strength and too much weakens the membrane.
 - 5.7.2 The temperature and pressure settings of welding equipment should be in accordance with the manufacturer's recommendations.
 - 5.7.3 Particular care also needs to be applied in welding on Powerbase Gas Barrier membranes in order not to completely melt through the layers. Elongation of the membrane should be avoided. Some Powerbase Gas Barrier membranes incorporate a reinforced grid to reduce the ability of the membrane to elongate.
 - 5.8 **Taping panels** As with welding, membranes should be clean and dry, free of any dirt, condensation, grease and other contaminants.
 - 5.8.1 To secure the sheets prior to taping, 30mm Powerbond double-sided jointing tape should be used in between a minimum 150mm overlap. All joins should be firmly pressed together using a hand-held pressure roller to ensure that the double-sided tape has adhered properly to the membrane.
 - 5.8.2 Additionally, for Methane protection, 75mm Powerbond single-sided sealing foil tape must be used to seal the top edge of the overlap. For other installations, optionally, the normal 75mm Powerbond single-sided sealing tape can be used.
 - 5.8.3 All corners of the membrane should be sealed with 300mm Powerbond single-sided detailing foil tape or 75mm Powerbond single-sided sealing tape (single-sided foil tape for Methane) to provide improved protection.
 - 5.8.4 Concrete columns and masonry surfaces must be thoroughly cleaned and primed with a quick drying primer before sealing. The membrane should be fixed to floor slabs, ground beams, concrete columns, steel stanchions and service pipes with double sided jointing tape and the edges of the membrane sealed with a sealing tape.



6 WELDING OR TAPING

- 6.1.1 As a general rule it is advised wherever possible to weld membranes in hydrocarbon contaminated sites. Welded joints are the most effective joint seal available.
- 6.1.2 However in certain circumstances, sub floor void ventilated, block & beam and suspended slab design, with concrete screed layer above the membrane, it is acceptable to install Powerbase VOC using Powerbond taping system.



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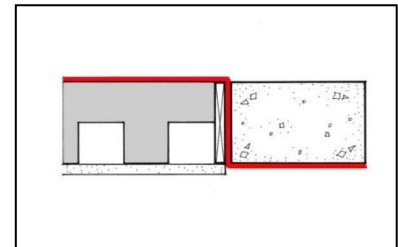
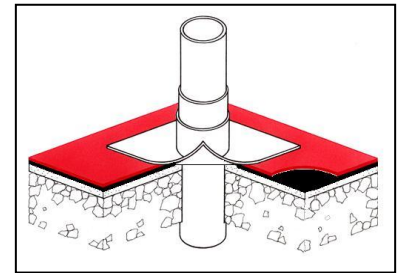
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- 6.1.3 As with methane contamination, Powerbond 30mm double sided tape is used between a 150mm overlap, the use of a hand held pressure roller is advised to seal the membrane to the tape. Powerbond 75mm single sided foil tape is then applied to the overlap loose edge.
- 6.1.4 Detail work & pipes.
- 6.1.5 Top hats & pre-formed corners can be supplied in Powerbase VOC, made to order.
- 6.1.6 Corners can also be formed using Powerbase 300mm single sided detail tape, overlapping the corner 150mm to each side.
- 6.2 **Covering** - When covering the barrier, care should be taken to ensure that the barrier is not displaced, damaged or stretched. If reinforced concrete is to be laid over the barrier, the wire reinforcements must be positioned so that they do not come into contact with the barrier.
- 6.3 **Service penetrations** - Where services need to penetrate the membrane, gas tight seals are required around each point of entry.
- 6.3.1 **Top Hats** – See separate installation detail. Top Hat sections should be used for sealing around pipe entries.
- 6.3.2 **Pipework** – Penetrating pipes should be sealed to the underlying membrane by dressing the pipework with Top Hats. In turn, Top Hats should be dressed with Powerbond 30mm double sided tape and a 75mm Powerbond sealing tape (single-sided foil tape for Methane and VOC) to seal to both the underlying Powerbase Gas Barrier membrane and to the pipe, Powerbond single sided tape is then applied overlapping the top hat and pipe and finished by applying a Jubilee clip and tightening until secure, please refer to separate top hat detail.
- 6.3.3 300mm Powerbond single-sided detailing foil tape should be used for corners and other detailing.
- 6.4 **Piling** – The side faces of the piling caps need to be sealed with quick drying primer to a depth of 200mm below the top. Powerbase Gas Barrier should finish 100mm from the top of the cap and sealed with 200mm jointing seal membrane.
- 6.5 **Ring beams** - Wherever ventilated polystyrene shuttering panels are installed before the ring beams on either internal or external walls, protection boards should be fixed to the side of the panels. These protection boards are necessary to support the barrier when the concrete is poured.
- Vent pipes – Vent pipes should be installed at regular intervals on all external walls to provide through air ventilation.
- 6.6 **Elongation** - Whilst elongation of any membrane should be avoided. Some Powerbase Barrier membranes incorporate a reinforced grid to reduce the ability of the membrane to elongate. Membranes are normally laid loosely on the site in order allow for any movement. They should not be pulled taught.
- If it is necessary to provide for further movement in ground-supported concrete slabs, the required elongation can be provided by installing a fold in the membrane.
- 6.7 **Inspection** - Prior to laying the upper slab or floor screed the membrane should be inspected to ensure that no damage has occurred during installation. Any damage should be repaired to ensure a gas tight seal. Inspection and repair of the membrane should be carried out by a qualified installation contractor. This inspection may also constitute a statutory notification to building control.
- 6.8 **Repairs** – Damaged areas must be repaired using patches of the same barrier membrane material. The area must be clean, dry and free of dust and grease. The patch must not extend beyond 150mm of the damaged area. The barrier patch is fixed using 30mm double-sided jointing tape and the overlaps taped with 75mm single-sided sealing tape (single-sided sealing foil tape for Methane).



7 POWERBASE MUTLIGAS SA

7.1 Description

- 7.1.1 Powerbase Multigas SA is an adhesive-backed tanking barrier membrane for adhesion to vertical or horizontal surfaces.
- 7.1.2 Powerbase Multigas SA provides exceptional resistance to Methane, Radon and CO2 and obviates the need for a separate Damp Proof Membrane.

Powerbase® is a Trade Name of Industrial Textiles & Plastics Ltd. E&OE.

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- 7.1.3 Powerbase Multigas SA and associated products are only designed for covered installations. Suitable protective layers such as sand or needle-punched geotextile should be provided if the exposed surface of the material is to be backfilled.
- 7.1.4 Powerbase Multigas SA is fully compatible with and can be welded to Powerbase Multigas 300. These components provide a complete and fully sealed system to protect structures from the ingress of harmful gases.

7.2 Surface Preparation

- 7.2.1 All surfaces to which Powerbase Multigas SA is applied should be smooth, dry and free of dust or loose debris.
- 7.2.2 Vertical surfaces of brick or block should be smooth and pointed to give a level surface. Uneven brick or block-work can be rendered prior to sealing to give an even surface.
- 7.2.3 All surfaces should be sealed using Powerbase Primer and left to dry thoroughly before applying Powerbase Multigas SA. For optimum results, porous surfaces should have two coats of Powerbase Primer.

7.3 Installation

- 7.3.1 Powerbase Multigas SA should be installed in a clean dry environment at air temperatures above 5°C.
- 7.3.2 Installation should only be performed by suitably qualified and competent installers.
- 7.3.3 Powerbase Multigas SA can be applied vertically or horizontally and may be cold-applied depending upon the temperature. A gas torch-on or hot air hand welder may have to be used in colder conditions and the adhesive surface should be heated until it forms a secure bond and then immediately applied under pressure to the pre-primed surface until it is stuck fast.
- 7.3.4 Position adjacent rolls to overlap a minimum of 50mm.
- 7.3.5 Any areas and edges should be pressed down using pressure rollers until stuck.
- 7.3.6 Leave 150mm of membrane exposed at the top (in the case of cap seals) or at the bottom (for standard ground seals or lift pit bases) to allow for welding or taping Powerbase Multigas SA to the main Powerbase Multigas 300.
- 7.3.7 Ensure that all overlaps and joints are fully sealed.
- 7.3.8 Where the membrane is **not** under compression loads (e.g. backfilled), mechanical fastening should be provided to minimise any risk of creep, especially in warm temperatures.
- 7.3.9 To minimise the risk of puncture from sharp stones or aggregates, Powerbase Multigas should be adequately protected using twin-wall sheets or needle-punched geotextile felt.
- 7.3.10 Detail is issued for guidance only and any detailing must be approved by the design engineer.

8 FURTHER INFORMATION

- 8.1 The above advice given is based upon currently available good practice and information and only offered as a general guide. Further practical details are given in the BRE 212, 'Construction of New Buildings on Gas contaminated land' and the BRE report 'Radon: guidance on protective measures for new buildings'.

9 NOTE

- 9.1 These installation instructions are based upon currently available good practice and only offered as a general guide. Final determination of the suitability of any information or material for the use contemplated and the manner of use is the sole responsibility of the user and the user must assume all risk and liability in connection therewith. Check the suitability and safety of the products for the use envisaged with all current and applicable national standards. Further practical details are given in BRE 212, 'Construction of New Buildings on Gas contaminated land' and BRE report 'Radon: guidance on protective measures for new buildings'.



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