



Gas Barriers: Design Guidance

This document is aimed at providing guidance for the use of protective measures for Ground Gas (Methane, Carbon Dioxide and Radon), VOC, and moisture protection, for new buildings, and remediation for existing buildings.

The guidance contained within is based on the most up to date standards and guidance contained within CIRA, BRE, NHBC guidance documents and BS8485:2015+ (A1 2019).

Interested parties are encouraged to contact JUTA UK directly to discuss specific product needs. It is recommended to engage with JUTA UK at the earliest possible opportunity when considering use of Gas Barriers. As a manufacturer of Gas Barriers we are well positioned to advise on all aspects of project conception, design and implementation; working closely with British Standards, (BSI), CIRIA, BRE and NHBC enables JUTA UK to stay abreast of current practices and proposed future changes so that the optimal solution is always proposed. Where applicable, JUTA UK can offer bespoke guidance, and provide training, seminars and presentations related to areas of interest.

JUTA UK encourages the use of the most up to date, and relevant guidance documents, and promoting the use of durable and sustainable products which are fit for purpose for the proposed function.

For the avoidance of doubt, this information is provided in good faith, and is prepared for the use of all specifiers, installers, users and verifiers of JUTA UK's range of products. This guidance document does not provide a comprehensive review of all guidance, and its use extends so far as to provide a summary, and quick assessment of guidance documentation.

For further reading, please refer to the following documents or contact JUTA UK for advice:

- BRE Report BR211 (2015) Radon: Protective measures for new building
- BS 8485:2015+A1:2019: Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings
- CIRIA (C735): Good practice on the testing and verification of protection systems for buildings against hazardous ground gases
- CIRIA (C748D): Guidance on the use of plastic membranes as VOC vapour barriers.
- BS 8102:2009: Code of practice for protection of below ground structures against water from the ground

Guidance for Design of Protection Measures for BS8485:2015 + A1:2019

The first step to determining the protective measures required is to define the site 'Characteristic Gas Situation' (CS), from assessment of the 'Gas Screening Value' (GSV). The GSV is identified through analysis of flow rates of specific hazardous gases, and assessment of borehole concentration while taking account of all other influencing factors, in accordance with a conceptual site model.

A summary table below indicates minimum Protection Score requirements dependant on CS site risk and building type.

BS8485:2015 + A1: 2019				
Gas Protection score by CS and Type of Building				
Minimum Gas Protection Score (points)				
	High Risk	Medium Risk	Low Risk	
CS	Type A Building	Type B Building	Type C Building	Type D Building
1	0	0	0	0
2	3.5	3.5	2.5	1.5
3	4.5	4	3	2.5
4	6.5 ^(a)	5.5 ^(a)	4.5	3.5
5	- ^(b)	6 ^(a)	5.5	4.5
6	- ^(b)	- ^(b)	- ^(b)	6
Notes	<p>^(a) Residential buildings should not be built on CS4 or higher sites unless the type of construction or site circumstances allow additional levels of protection to be incorporated, e.g. high-performance ventilation or pathway intervention measures, and an associated sustainable system of management of maintenance of the gas control system, e.g. in institutional and/or fully serviced contractual situations.</p> <p>^(b) The gas hazard is too high for this empirical method to be used to define the gas protection measures.</p>			

Once a CS has been defined a suitable solution can be selected and proposed.

The gas protection system (score) as defined in BS8485:2015, should consist of at least two different elements; for example, a membrane solution with a structural barrier element, or a ventilation/dilution element (or both).

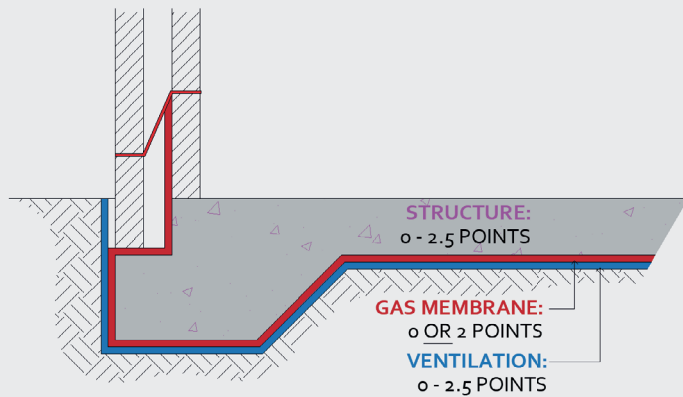
The elements work independently and collaboratively, and a single element should not be used because there would be no redundancy to allow for defects in the component.

The Structural Barrier itself (floor slab and substructure) will offer an element of protection itself, scoring between 0 and 2.5 dependant on the proposed element.

Ventilation can also provide between 0–2.5 points. The membrane can only achieve a score of 0 or 2. The diagrams below indicate the possible points achievable for applications above and below ground the component.

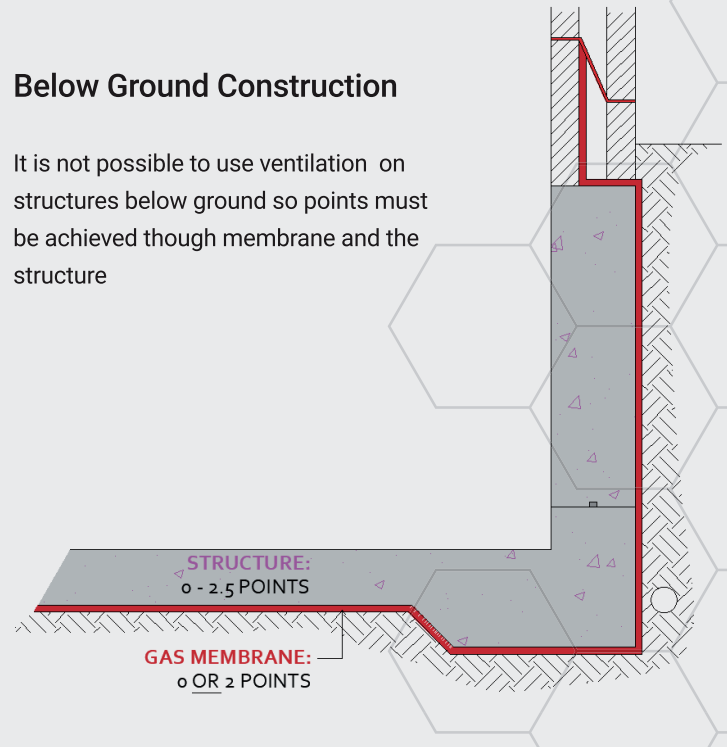
Ground Bearing Construction

Structures at ground level can achieve the necessary points through: membrane, the structure itself, and ventilation below the slab.



Below Ground Construction

It is not possible to use ventilation on structures below ground so points must be achieved through membrane and the structure



**Guidance for Design of
Protection Measures for
BS8485:2015 + A1:2019**

JUTA UK manufacture and offer solutions for gas barrier and ventilation components. The table below indicates what protection score points can be achieved with the various components.

The scores below are for guidance only so please contact JUTA UK directly to discuss project specific applications.

BS8485:2015 + A1: 2019 Gas Protection score by product			
Product Type	Product	Protection Score	Condition of Use
Ground Gas Barrier	GP®1	2	Loose laid Gas DPM - Full coverage
Ground Gas Barrier	GP® LGB	2	Liquid Applied Barrier - Used for continuity to pile heads and foundations
Ground Gas Barrier	GP® SAM	2	Self-Adhesive Membrane - Gas and Waterproofing and slab edge applications.
Ground Gas Barrier	GP® TITANTECH®	2	Pre/Post Applied & Loose Laid VOC/ Hydrocarbon & Waterproofing Barrier.
Ventilation	Void Vent 25	Contact JUTA for further advice	Laid as strips - (recommended minimum)
Ventilation	Void Vent 25		≤CS4 or small-medium building (<15,000mm width) Full coverage - vents at 1500mm ² /m
Ventilation	Void Vent 25		Large building (>15,000mm width) Full coverage - vents at 2000mm ² /m
Ventilation	Void Vent 40		≤CS4 or small-medium building (<15,000mm width) Full coverage - vents at 1500mm ² /m
Ventilation	Void Vent 40		Large building (>15,000mm width) Full coverage - vents at 2000mm ² /m

CIRIA C748

Guidance on the use of Plastic Membranes as VOC Barriers

From C748: Guidance on the use of Plastic Membranes as VOC Vapour Barriers, states:

'The Membranes for building protection are most likely to be placed over the floor slab or below the floor slab on a prepared sub-base or ventilating layer. The membrane is not likely to be in direct contact with the source of any vapours and so the exposure is far less. The vapour concentrations should be low, which will minimise the risk of chemical degradation of the membrane. (Testing shows damage by VOC's to membranes is based on the use of 100% concentration of challenge chemicals, rather than a dilute solution. Vapour concentrations in the ground immediately below the slab are typically at concentrations less than 1% v/v in air).'

Care must therefore be taken to mitigate and prevent through design direct contact of barrier membranes with the source or vapours. Where it is unavoidable to prevent direct contact of the barrier membrane to the source, appropriate barrier selection should include for the potential of direct contact with the source contaminant.

CIRIA C735

Good practice on the testing and verification of protection systems for buildings.

The verification of Gas protection systems has come about as an industry reaction to poor practices in the past and is the result of a cross industry working group in conjunction with CIRIA (Construction Industry Research & Information Association).

In the revision of BS8485 2015 the importance of Verification has been notified and if a gas barrier is to be considered as part of a gas protection system, then it must be verified.

This publication provides good practice guidance for the designer, installer, verifier and regulator on the verification and integrity testing of gas protection systems. It sets out a flexible, risk based and practicable framework that can be adapted to provide site specific advice on the need for and scope of verification activities (including any integrity testing).

Recommendations are presented for the promotion of the good practice described in this publication and for recognition of the important role that local authority (LA) regulators play in its increased acceptance and application throughout the industry.

The validator is in place to collate evidence to enable the discharge of planning conditions related to ground gas and to ensure that what has been designed is installed to appropriate best practice standards, in line with material manufacturers installation guidance, and is not to comment on the design or materials unless those installed do not match the specification for the project.



NHBC adopt many of the principles in the BS8485 and CIRIA documents but use a traffic light system to classify the gas protection requirements.

NHBC expectations for verification to satisfy the Traffic Light gas regime classifications are as detailed in Table 1 below:

NHBC: Typical expectation of Gas Protection Requirements and Verification

Gas Regime	Minimum Gas Protection Expectations	Minimum Verification and information requirements
Green	N/A - Need to conform to BRE 211 requirements where applicable.	
Amber 1	Ventilation – subfloor venting to achieve at least one air exchange per day (minimum 150mm void height; 1500mm ² /m air vent opening or 500 mm ² /m ² floor area spaced at not more than 2 m centres on at least two opposing sides). Membrane – must be suitable for purpose. Membrane installation/design - to achieve complete integrity across entire building footprint. Penetrations and joints sealed	Construction drawings – showing position of membrane; sealing details and ventilation points to be provided. Membrane specification – technical data sheet(s) for gas membrane (including gas permeability data) to be provided. Installation – photographic evidence of installed membrane may be requested
Amber 2	Ventilation – subfloor venting to achieve at least one air exchange per day. Membrane – must be suitable for purpose (criterion detailed in BS8485:2015 clause 7.2.4). Membrane installation and design to achieve complete integrity across entire building footprint. Penetrations and joints sealed. Installer – installers must be experienced and appropriately trained and/or qualified	Construction drawings showing position of membrane, sealing details and ventilation points to be provided. Membrane specification – technical data sheet(s) for gas membrane (including gas permeability data) to be provided. Installation – third-party verification report with supporting evidence to be included (i.e. photographic evidence and certificates of conformity, observations relating to sealing, location of ventilators and standards of installation). Integrity testing – may be requested; testing plan to be agreed in advance
Red	Standard residential housing is not generally acceptable without further ground gas risk assessment and/or possible remedial mitigation measures to reduce or remove the source of the ground gases	
Notes	<p>NHBC supports the revised British Standard Code of Practice (BS8485:2015), which provides a standardised UK approach that can be used to demonstrate compliance with Building Regulations.</p> <p>The NHBC Traffic Light guidance can still be used where the development proposals are based on the 'typical house' used in the modelling for the traffic light classification system. A typical house is defined as a house (up to three storeys) with <100m² footprint and minimum 150 mm depth clear ventilated void achieving sub-slab ventilation of one complete air exchange per day.</p>	

Product Selection Tool

Guidance Documents									
	BRE 211	NHBC (Amber 1)	BS8485 :2015 + A1 2019 / NHBC (Amber)	C748	C748	BS8102 : 2009	RPS178	C753	BBA Agreement Certificate
	Radon	Bulk Ground Gases	Carbon Dioxide and Methane	VOC Vapour Permeation	Hydrocarbons Immersions	TYPE A - Bonded Waterproofing	Invasive Weed Control	SuDs Impermeable Membrane	
GP®1	X	X	X						X
GP®2	X	X							X
GP®4	X	X							X
GP®5	X	X	X						X
GP®H	X	X				X	X	X	X
GP®L	X	X					X	X	X
GP® SAM	X	X	X			X			X
GP® TITANFLEX®	X	X	X	X	X	X	X	X	X
GP® TITANBOND®	X	X	X	X	X	X	X		X
GP® TITANTANK®	X	X	X	X	X	X	X		X
GP® LIQUID GAS BARRIER	X	X	X						
HDPE 0.6 mm	X	X					X	X	

Notes

* Provided GP®1 is not in direct contact with the ground, or in hydrostatic conditions; where a clear void of ≥150 mm (or Void Vent) is provided below the Ground Bearing slab to provide ventilation, then GP®1 may be suitable for use as a VOC Barrier, subject to site specific assessment and detailed design.

**JUTA GP® TITANTECH® membranes are specifically designed to meet the requirements of C748, including permeation testing for a range of challenge chemicals.