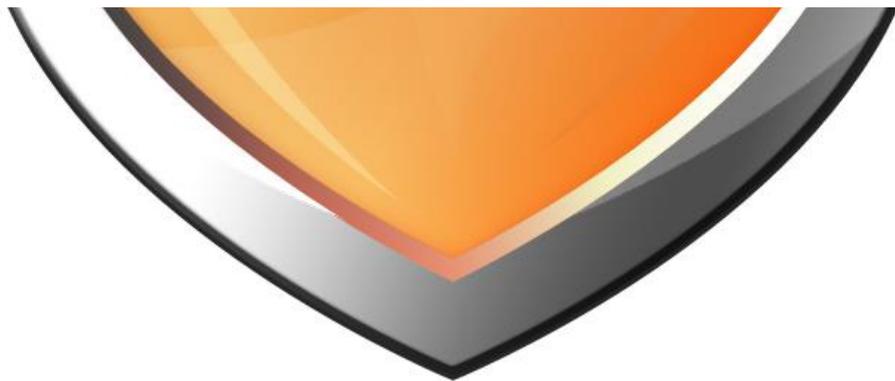




PUDLO System

Gas Protection Guidance



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About this Guidance

This guidance note has been put together to provide the specifier with the most up to date information since the new changes were implemented in CIRIA, BRE, NHBC and BS 8485:2015 Code of Practice for the Design of Protective Measures for Methane, and Carbon Dioxide Gases for New Buildings.

As a supplier of membranes for gas and water protection, PUDLO is well positioned to give the best advice possible. PUDLO is always on hand to discuss any specific requirements our customers may have. Where applicable, PUDLO can offer a full CAD design for water protection and gas protection (where dual requirement is needed), along with attending design meetings.

This guidance note has been produced and distributed in good faith and does not replace any existing standards currently out there but takes a brief overview from each to give you as much help as possible.

Note: PUDLO does not offer a warranty for gas protection. However, with a robust design, correct membrane installation by an approved installer and verification plan put in place by a 3rd party independent assessor, a structure can achieve full gas protection.



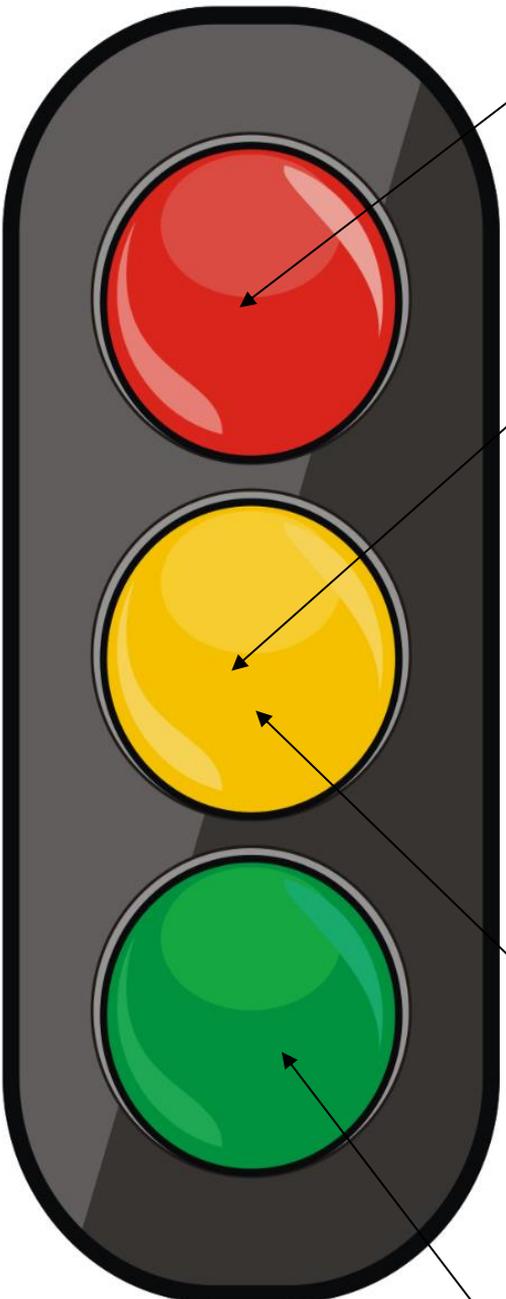
NHBC: Guidance on Use of Protective Measures

NHBC has its own traffic light system for projects where it is involved. The NHBC traffic light system can be used where the development proposals are based on 'typical house'; used in the modelling for the traffic light classification system.

A 'typical house' is a house (usually 3 storeys) with <math><100\text{m}^2</math> and minimum depth of 150mm clear, ventilated void, achieving sub-slab ventilation of one complete air exchange per day.

NHBC is fully supportive of the revised British Standard BS 8485:2015 code of practice.

PUDLO GP Titan Bond is a fully designed system, which has been recognised and accepted by NHBC to offer gas protection in conjunction with waterproofing.



Red: Standard residential housing is not generally acceptable without further ground risk assessment and/or possible remedial mitigation measures to reduce or remove the source of the ground gases

Minimum Gas Protection Requirements (Amber 1):

Ventilation

- Membrane must be suitable for purpose.
- Membrane installation/design to achieve complete integrity across entire building footprint. Penetration and joints sealed.
- Subfloor venting to achieve at least one air exchange per day (min 150mm void height; 1500m²/m air vent opening or 500mm²/m² floor area spaced at not more than 2m centres.

Minimum Verification Requirements (Amber 1):

Construction

- Construction drawings to show positions of membrane, sealing details and ventilation points to be provided. Membrane specification includes technical data sheet for gas membrane (including gas permeability data to be provided). Photographic evidence of installed membrane may be requested.

Minimum Gas Protection Requirements (Amber 2):

Ventilation

- Membrane must be suitable for purpose (as per BS 8485:2015 7.2.4).
- Membrane installation to achieve complete integrity across entire building footprint.
- Installers must be properly trained.
- Subfloor venting to achieve at least one air exchange per day.

Minimum Verification Requirements (Amber 2):

Construction

- Construction drawings to show positions of membrane, sealing details and ventilation points to be provided.
- Membrane specification includes technical data sheet for gas membrane (including gas permeability data to be provided).
- Installation – 3rd party verification report with evidence & integrity testing.

Green: N/A – Needs to conform to BRE 211 requirements where applicable.

BS 8485:2015 Guidance on Use of Protective Measures

Defining the site's 'Characteristic Gas Situation' from assessment of the 'Gas Screening Value' is the first step to determining the protective measures. This is taken from the analysis of flow rates of specific gases within the site zone. Bore holes are created to assess the flow rate measurements and take account all other factors in accordance with a site model.

Building types require a minimum protection score as shown in the table below:

BS 8485:2015 – Minimum Gas Protection Score (Points) by Building Type				
CS	High Risk Type A Building	Type B Building	Medium Risk Type C Building	Low Risk 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)	6.5 ^(A)	5.5	4.5
6	^(B)	^(B)	7.5	6.5

Notes:

(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.

(B) The gas hazard is too high or this empirical method to be used to define the gas protection measures.

Upon review of the table above in conjunction with the ground conditions, once the characteristic gas situation (CS) has been determined, a suitable gas protection system can be selected.

Gas protection scores as defined in BS 8485:2015 should consist of two different elements. An example of this could be a structural barrier element with either a membrane or a ventilation / dilution element (or both). These elements work independently and collaboratively. A single element should not be used as there would be no scope to allow for defects in the system.

The structural barrier itself (floor slab and substructure) will offer an element of protection, scoring between 0 and 2.5, dependent on the proposed element.

BS 8485:2015 Gas Protection Score by Product

Ground Gas Barrier

Product	Protection Score	Condition of Use
PUDLO GP Titan Bond	2	Full Coverage – BBA Certificate Pending (contact PUDLO for more info)

Ventilation

Product	Protection Score	Condition of Use
Void Vent 25	0.5	Laid as strips (recommended minimum)
Void Vent 25	1.5	≤CS4 or small-medium building (<15,000mm width) Full coverage – vents at 1500mm ² /m
Vid Vent 25	0.5	Large building (>15,000mm width) Full coverage – vents at 2000mm ² /m
Void Vent 40	2.5	≤CS4 or small-medium building (<15,000mm width) Full coverage – vents at 1500mm ² /m
Void Vent 40	1.0	Large building (>15,000mm width) Full coverage – vents at 2000mm ² /m

Whilst looking at the system, influences such as hydrostatic conditions should be considered along with the likelihood of the source contaminant being in direct contact with the protective measure proposed.

CIRIA C748 – Guidance on the Use of Plastic Membranes as VOC Barriers

The above guidance document states that membranes for building protection are most likely to be placed over a 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 or any vapours so exposure is far less. The concentrations of the vapour should be low, which will minimise the risk of chemical degradation of the membrane. Testing has shown damage by VOCs to membranes is based on the use of 100% concentration of chemicals, rather than diluted solutions.

During the design process, care should be taken to avoid direct contact of barrier membranes with the source or vapours. Should it be unavoidable to prevent direct contact of the barrier membrane to the source, appropriate barrier selection should be included.

CIRIA C735 – Good Practice on the Testing and Verification of Protection Systems for Buildings against Hazardous Ground Gases

CIRIA C735 was written in conjunction with a steering group to provide good practice guidance for the designer, installer, verifier and regulator on the verification and integrity testing of gas protection systems. The document sets out risk-based, practical and flexible frameworks which can be adopted to provide site specific advice on the need for verification visits (and integrity testing). This document gives clear advice on the verification plan which should always be prepared as part of the design for any gas protection system.

The gas membrane must have the ability to survive the construction process intact and reduce the permeation of gases / vapours to extremely low levels.

Gas protection systems should be installed by a qualified workforce. The verification of the installation of gas membranes should be carried out by an experienced person who is suitably trained. The verification process must be independent and the verification report cannot be carried out by the manufacturer of the membrane or someone who has designed the gas protection. CIRIA C735 covers the following topics:

- Testing and Verification of Gas Protection Systems (Needs and Issues)
- Verification Procedures
- Integrity Testing
- Reporting
- Recommendations

CIRIA C665 – Assessing Risks Posed by Hazardous Ground Gases to Buildings

CIRIA C665 gives up to date advice on all aspects of gas protection. The guidance document contains good practice in investigation, collection of data and monitoring programmes in a risk-based approach to gas contaminated land. There are two methods set out for the risk assessment, these are:

- 1) For low rise housing with a ventilated under floor void at minimum 150mm
- 2) For all other development types

Both methods use the concept of traffic lights to identify levels of risk. The management of potentially unacceptable risk is described with reference to both passive and active systems of gas control.

Post development monitoring to confirm predicted behaviour is important in the remediation of contaminated land. However, in terms of development on or adjacent to gassing land (particularly for housing developments), it is recognised that particular circumstances apply, such as long term or post construction monitoring.

Topics covered within CIRIA C665 are:

- Hazardous Gases
- Development of Initial Conceptual Model and Preliminary Risk Assessment
- Methods of Non-Intrusive Investigation
- Monitoring Methodologies
- Sampling Methodologies
- Interpretation of Results
- Assessment of Risk
- Remedial Options
- Post Development Monitoring
- Recommendations for Research

Please contact PUDLO on 01954 780687 or sales@pudlo.com if you require further information or support on gas protection.



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