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PHASE III – REMEDIATION STRATEGY

Margam Substation

BAKERHICKS PROJECT No.: 30004595

LOR REFERENCE No.: MARPT-BHK-01-XX-RP-G-100006

National Grid Reference Number: 10_LOR_0001

DESIGN WORK PACKAGE: DP-2001

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Prepared for:

Laing O'Rourke

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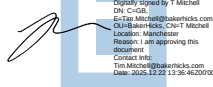
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Appendix A. Gas Protection Measures

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1. Introduction

1.1. Scope and Objectives of the Scheme

TATA Steel UK Limited is planning to replace their two blast furnaces at Port Talbot with an electric arc furnace. In September 2023, Tata Steel and the UK Government announced a joint investment in state-of-the-art electric arc furnace steelmaking at the Port Talbot site. The installation of the arc furnaces is aimed at reducing operating costs, securing jobs, and making the company more environmentally friendly.

In April 2024, TATA Steel UK Ltd signed a connection agreement with NGESO (National Grid Electricity System Operator) for new supplies to their site in Port Talbot. The objective is to provide new 33kV supplies to TATA Steel UK and establish a connection point for transmission network reinforcement and future customer connections. The deadline for the new supplies is October 31, 2027.

The scheme will deliver the following works:

- Extension to the existing Margam 275kV substation.
- Installation of gas insulated switchgear (GIS) at Margam 275kV substation. This will replace the existing air insulated equipment and facilitate the connection of new and future transmission circuits.
- Construction of a new MSCDN at Margam 275kV substation.
- Diversion of the existing overhead line and SGT (Super Grid Transformers) circuits to new bays within the GIS.
- Provision of GIS bays for future MIS and Y Bryn circuits.
- Establishment of a new 275/33kV substation at TATA Steel UK Ltd, Port Talbot.
- Installation of two 275kV cable interconnectors between the new GIS at Margam 275kV substation and the new Port Talbot 275kV substation. This includes approximately 3km of underground cable with 3no. Horizontal Directional Drills (HDDs)
- Creation of 33kV connections between the new Port Talbot 275kV substation and the user's substation at TATA Steel UK Ltd.
- Modifications to interconnecting circuits at Baglan Bay 275kV and Pyle 275kV substations.
- Provision of a Local Demand Tripping Scheme (specific requirements to be confirmed later).

Laing O Rourke (LOR) has been appointed as main works contractor for the scheme by National Grid (NG). LOR have commissioned BakerHicks to undertake the detailed design for the scheme including commission for Structural, Electrical, Architectural and Geo-environmental services.

1.2. Scope of Remediation Strategy

This report considers the proposed Margam Substation and surrounding redline boundary only and has been prepared to aid the Client in support of an anticipation Planning Condition. The site is proposed to be developed into a National Grid Electricity Transmission (NGET) substation with enclosed structures (i.e. GIS Hall and Amenity Building) included. The proposed site plan is shown on the Margam GIS Hall – Proposed Site Plan drawing (ref: MARPT-BHK-01-ZZ-DG-A-130023 Rev P05, dated July 2025), a copy of which is included in Appendix B.

This document has been prepared in accordance with the requirements of Land Contamination Risk Management (LCRM) as stipulated by Natural Resource Wales for the management of risks associated with historic land contamination.

This document has been prepared in accordance with BS 10175:2011+A2:2017 – Investigation of Potentially Contaminated Sites (Ref. [1]) and the requirements of Land Contamination Risk Management (LCRM) (Ref. [2]) as stipulated by Natural Resource Wales (NRW) for the management of risks associated with historical land contamination.

BakerHicks previously produced a Ground Investigation Report (Ref. [3]) for the site which utilised data collected by third-party contractors and concluded there was a remedial requirement in relation to ground gas.

Remediation is therefore required to address unacceptable risks to future site users from ground gas concentrations within the context of the proposed site development. This report is intended to support with design, and as necessary the discharge of land quality planning conditions.

1.3. Aims of Remediation Strategy (RS)

The principal aim of this document is to provide a framework to address the land quality issues. This includes:

- Providing a strategy to address the ground gas issues considered to pose an unacceptable risk in the context of the proposed development
- Outline the process for managing the remedial works including health and safety.
- Outline the independent supervision and verification requirements to enable provision of the Verification Report sufficient to enable relevant planning conditions to be discharged.

1.4. Regulatory Framework

This document is produced in accordance with LCRM (Ref. [2]) and references the following best practice guidance:

- CIRIA C665: 2007 Assessing risks posed by hazardous ground gas to buildings (Ref [4]).
- BS8485:2015+A1:2019 Code of practice for the design of proactive measures for methane and carbon dioxide ground gases for new buildings (Ref [5]).
- CIRIA C735 Good Practice on the testing and verification of protection systems for buildings against hazardous ground gases, 2014 (Ref [6]).
- YALPAG Verification requirements for gas protection systems – Technical guidance for Developers, Landowners and Consultants, 2016 (Ref [7]).

1.5. Project Stakeholders

The project stakeholders are summarised in Table 1-1.

Table 1-1: Roles and Responsibilities

Role	Responsibilities
Client (LOR)	- Appoint a Principal Designer and Principal Contractor. - Appoint a competent Suitably Qualified Installer to undertake the membrane installation works. - To facilitate liaison between all parties.
Contractor (TBC)	- To undertake the works in accordance with the RS. - To provide agreed verification documentation to the Geo-Environmental Engineer.
Local Authority – Neath Port Talbot Council	- Planning authority. - Agreement of RS. - Agreement to sign off Verification Report following completion of works as defined within this document.
Geo-Environmental Engineer - BakerHicks	- To review final design schematics prior to works. - To provide guidance and clarification on the RS - To providing monitoring and verification works including the production of the Verification Report.

1.6. Existing Documents

This RS should be read in conjunction with the following documentation:

- MARPT-BH-01-XX-RP-G-090001 Ground Investigation Report: Margam Substation – Margam Connection 22nd August 2025 (Ref. [3]).
- MARPT-BHK-01-XX-RP-G-090005 Phase I Geo-Environmental Desk Study: Margam Substation November 2025 (Ref [8]).

1.7. Assumptions and Limitations

This report is addressed to and may be relied upon by the following party:

Laing O'Rourke (LOR)

This assessment has been prepared for the sole use and reliance of the above-named party. This report shall not be relied upon or transferred to any other parties without the express written authorisation of BakerHicks. No responsibility will be accepted where this report is used, either in its entirety or in part, by any other party.

2. Project Background

A Phase I Desk Study was produced by BakerHicks (Ref [8]), to support the Planning Application across the Margam Substation's Red Line Boundary. The Phase I Desk Study was produced following ground investigation reported within the BakerHicks Geotechnical Ground Investigation Report (Ref [3]), which was designed based on a wider geotechnical desk study (Ref [9]) for the whole of the development site as outlined in Section 1.2. The GIR included a geo-environmental assessment and Conceptual Site Model.

The Phase I Desk Study involved a more detailed and site specific review of the Margam Substation Site and included a review of the GIR; the findings of which were considered sufficient to consider risks identified within the Conceptual Site Model, thereby mitigating the need for supplementary Phase II investigation.

Pertinent information relating to the site setting from the Desk Study report (Ref [8]) and the Ground Investigation Report (Ref. [3]) is summarised below:

2.1. Site Setting

Table 2-1: Site Setting

Site Address	Proposed Margam Substation, Port Talbot, South Wales
National Grid Reference	SS 78580 86373
Total Site Area	Approximately 15.5 hectares
Current Site Use	The Phase I Desk Study report describes the current site usage (as observed during their walkover in October 2025 as follows): The majority of the site appears to be peaty boggy ground, with hardstanding generally limited to pathways around the site in order to make the site more accessible. The ground is uneven however no slopes were present. With the exception of the existing substation the only permanent structures on the site were the overhead line pylons which lead to the substation. There were several temporary site cabins on hardstanding gravel forming the LOR construction compound however this was in the process of being transferred on the day the walkover was being completed, and the final layout of the compound is still to be confirmed.
Access	Access is from the north, via an access road which leads from Cefn Gwrgan Road and a residential area, progressing from the A48.
Topography	The site is shown to be generally flat with level change of less than 5m across the length of the site.

2.2. Published Environmental Setting

Table 2-2: Environmental Setting

Geology	Geological mapping indicates the site is largely underlain by superficial soils comprising the Tidal Flat deposits which underly the majority of the site, with a small amount of the northern spur bordering Alluvial Fan Deposits and Glaciofluvial Ice Contact Deposits. Mapping indicates that the northern spur along with the western site boundary is underlain by undifferentiated Landscaped Ground. The bedrock underlying the site consists of the South Wales Middle Coal Measures Formation.
Hydrology	The Phase I Desk Study identifies 39 no. un-named and named inland watercourse within the site likely relating to 19 no. separate watercourses. These are all drains crossing the site and are generally associated with the Upper and Middle Mother Ditch.
Hydrogeology	The groundwater at the site is split into a secondary A Aquifer within the bedrock deposits and a Secondary (Undifferentiated) Aquifer within the superficial deposits.
Mining	The site is located within a Coal Mining Reporting Area as detailed in the BakerHicks Coal Mining Risk Assessment; Ref [10]).
Radon	The Groundsure report within the Phase I Desk Study (Ref [8]) shows the site is in a lower probability radon area (>1% of homes are estimated to be at or above the Action Level). At this level BRE publication BR211 indicates that special radon protective measures are not required in the construction of new dwellings or extensions.

2.3. Summary of Ground Investigation Results

2.3.1. Geology

The recorded ground conditions indicate that the site was generally underlain by topsoil to depths of up to 0.7m bgl, beyond which are Cohesive Tidal Flat Deposits consisting of silts, clays and thick bands of Peat to depths of between 1.10m and 5.80m bgl. This was underlain by Glacial Till mostly consisting of sandy clays to depths of 13.30m bgl with occasional granular deposits encountered to depths of 8.60m bgl thought to indicate a glacial meltwater channel. The Coal Measures were encountered from depths of 13.30m bgl and extended to a maximum proven depth of 49.50m bgl. Made ground was encountered within one location (attempted three times) to the termination of each pit at a maximum depth of 2.30m bgl.

Groundwater was observed within the Made Ground, the topsoil, the shallow Tidal Flat Deposits, the granular Glacial Till and within the Coal Measures. The groundwater at the site is considered to be artesian in nature.

2.3.2. Human Health and Water Environment Risk Assessment

The BakerHicks Ground Investigation Report identified a potential risk to Human Health, which was limited to Ground Gas.

Following a review of the ground gas data collected as part of the investigation alongside assessment of potential sources of ground gas, pathway and receptors post-development it was determined that a Characteristic Situation 2 regime was applicable. This requires the installation of gas protection measures.

2.4. Conceptual Site Model

The BakerHicks desk study report (Ref. [8]) identified a high overall risk from ground gas within the Conceptual Site Model (CSM). The refined CSM of the GIR (Ref. [3]) identified a low risk with regards to ground gas and classified the site as CS-2. A summary of the CSM sections pertinent to this RS are presented in Table 2-3.

Table 2-3: Refined Conceptual Site Model

Source	Receptor	Potential Risk Rating	Comment
Ground gases (carbon dioxide and methane)	Future site users Future Buildings / Structures	Low	Gas protection measures in line with CS-2 site classification.

3. Remediation Strategy

3.1. Introduction

To enable the development of the site a gas protection system is required that is appropriate for the proposed development and the level of risk associated with the site. This gas protection system needs to be installed correctly so it can be relied upon to provide the required level of protection. Ultimately, it needs to be demonstrated that in terms of gas risk, the proposed development is suitable for use.

3.2. Health and Safety

The works should comply with the Construction Design Management Regulations (CDM) 2015. The Client appointed Principal Contractor will have overall responsibility for health and safety management of the proposed remediation works. Prior to works being undertaken appropriate health and safety documentation will be formulated by the Principal Contractor and any associated sub-contractors. The documents must include risk mitigation measures for staff involved in remedial works i.e. the use of gas alarms and testing prior to entry into trenches or excavations. Consideration to the risk from carbon dioxide to ground workers should also be undertaken.

3.3. Unexpected Contamination

Although remediation of the soils and groundwater at the site has not been recommended, a contingency plan should still be made to manage unexpected contamination encountered during the earthworks.

The Earthworks (Main Works) Contractor will cover this procedure within their method statements, and this should include:

- Stopping the works in the areas where unexpected visual or olfactory evidence of contamination is observed.
- Informing the Geo-Environmental Engineer (if absent from site), the Local Authority Contaminated Land Officer and any other authorities (such as the HSE with respect to asbestos).
- Appropriate sampling and laboratory analysis of potentially contaminated materials to assess the severity and scale of any suspected contamination.
- Assessment of the results.
- Development of a corrective action plan.

3.4. Remedial Objectives

Based upon the outcomes of the BakerHicks Ground Investigation report the remediation objectives that have been identified are summarised in Table 3-1.

Table 3-1: Remediation Objectives and Activities

Remediation Objectives	Outline Remediation Measures
Manage future potential exposure risks to future site users following completion of the development works through exposure to ground gas at concentrations which could cause asphyxiation and explosion.	To avoid exposure to carbon dioxide and methane gas protection measures should be installed during the construction of the buildings.

3.5. Selection of Appropriate Gas Protection Measures

Table 3-2 demonstrates the approach that is proposed for the selection, design and reporting of the gas protection measures as part of this RS.

Table 3-2: Summarised Solutions Flow Chart, Stage in Process and Reporting Stage

Items	Details	Proposed Reporting Stage
Selection of gas protection measures	Determine the Building Type as per BS8485:2015 (further details in Section 3.5.1)	Phase III Remediation Strategy
	Consider how the score might be achieved by combining two or more protection elements (further details in Section 3.5.2)	
	Requirements for Verification (further details in Section 4)	
	Outline gas protection measure design drawings (including in Appendix A)	
Design of gas protection measures	Preliminary design and specification of each protection element and how this complies with the strategy set out in the RS.	
Submission of Remediation Strategy	Submission of the remediation strategy to the Local Authority prior to installation of gas protection measures.	Verification Report
Detailed design of gas protection measures	Detailed design of final gas protection measures and how they have been installed.	
Installation of Gas Protection Measure	Evidence of verification of gas protection measures during installation and how this complied with the RS	
Verification	Production of the Verification Report	
Submission of Verification	Provision of the Verification Report to the Local Authority	

3.5.1. Building Type

BS8485:2015 specifies four main building types: Type A to Type D. Table 3-3 and the following section set out the details for each building type. A development plan is included as Appendix B.

Table 3-3: Building Types

	Type A	Type B	Type C	Type D
Ownership	Private	Private or commercial / public, possible multiple	Commercial / public	Commercial / industrial
Control (change of use, structural alterations, ventilation)	None	Some but not all	Full	Full
Room Sizes	Small	Small /medium	Small to large	Large industrial / retail park style

Type A – Examples include private housing and some retail premises.

Type B – Examples include managed apartments, multiple occupancy offices, some retail premises and parts of some public buildings i.e. schools and hotels.

Type C – Examples include offices, some retail premises and parts of some public buildings.

Type D – Examples are retail parks, factory shop floors and warehouses.

Building Type Selected

Based on the assumed outline design of the building, and in accordance with BS8485, two types of building are proposed to be constructed at the site:

- Building Type C – Amenity Building / The GIS hall has several small rooms within its overall construction
- Building Type D – The main GIS Hall is a 12m high 70m long and therefore falls within the building type D.

Due to the GIS Hall being a single combined building the worst case building type has been selected for the building, which is “Type C”. This building type also aligns with the Amenity Building, meaning that a Type C building covers both developments. For completeness with regards the GIS Hall, the assessment below also presents scoring for a Type D building.

A proposed development plan is included as Appendix B.

3.5.2. Scoring in accordance with BS8485:2015+A1:2019

In accordance with Table 4 of BS8485:2015+A1:2019, a minimum score of 2.5 is required for ‘Type C’ structures with a CS2 classification. A minimum score of 1.5 is required for ‘Type D’ structures with a CS2 classification, however as discussed above the single combined ‘Type C’ structure is being selected. This is to be achieved from measures outlined in Tables 5 to 7 of BS8485:2015+A1:2019.

To achieve the scores required, the gas protection measures shown in Table 3-4 are proposed for the GIS Hall. It is understood that a pressure relief pathway cannot be guaranteed for the proposed structure and as such has been excluded from the scoring. Standard detailing drawings for the proposed gas protection measures for the GIS Hall are included in Appendix A.

Table 3-4: Gas Protection Score GIS Hall

Gas Protection Measures	Score	
	Type C (2.5 score)	Type D (1.5 score)
Structural Barrier Cast in-situ monolithic reinforced ground bearing raft or reinforced cast in-situ suspended floor slab (with minimal penetrations) ¹	1.0	1.0
Membrane Gas resistant membrane meeting all of the following criteria: • Sufficiently impervious • Sufficiently durable • Sufficiently strong • Capable of providing a complete barrier • Verified in accordance with CIRIA C735	2.0	2.0

TOTAL SCORE	3.0	3.0
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¹ to achieve a score of 1.5 the raft or suspended floor should be well reinforced to control cracking and have minimal penetrations cast in. Given the proposed development and the potential number of service entry points, a score of 1 has been assigned. Should minimal service entry points be proposed the score may be able to be increased to 1.5

For the proposed Amenity Building, the gas protection measures are detailed in Table 3-5.

Table 3-5: Gas Protection Score Amenity Building

Gas Protection Measures	Score
	Type C (2.5 score)
Structural Barrier Precast suspended segmental subfloor (i.e. beam and block)	0.0
Ventilation Passive sub floor dispersal layer: Good Performance: Clear void and / or no fines gravel layer ¹	1.5
Membrane Gas resistant membrane meeting all of the following criteria: • Sufficiently impervious • Sufficiently durable • Sufficiently strong • Capable of providing a complete barrier • Verified in accordance with CIRIA C735	2.0
TOTAL SCORE	3.5

¹ The passive ventilation layer must adhere to BS8485 and meet the criteria of Appendix B including but not limited to Figures B.6 and B.7.

The proposed gas protection measures, if designed in accordance with BS8485:2015+A1:2019 can achieve a points score of 3 for both Type C and D buildings for the GIS Hall and 3.5 for the Amenity Building, which is compliant with the requirements of gas protection measures specified in BS8485. It is recommended that discussions with suppliers regarding the combined scoring of the structural barrier, ventilation, and membrane are ongoing throughout the development to ensure the required scoring is achieved.

Should development plans alter, this Remediation Strategy will need to be updated to reflect any impactful changes.

Validation of gas protection measures will be required in accordance with CIRIA publication C735:2014, further detailed within Section 4.

4. Verification Requirements

4.1. Introduction

Best practice, as outlined by YALPAG (Ref. [7]) states that implementation and verification for gas protection systems should always be site specific and based on the gas risk assessment and conceptual site model (CSM). Whilst the site fall outside of YALPAG administrative boundaries the guidance is considered to align with best practice and therefore appropriate for developments elsewhere in the United Kingdom.

For gas protection systems, acceptable verification generally comprises the provision of clear evidence that the level of protection is appropriate to the established risk and has been installed by suitably experienced personnel in line the manufacturer's instructions and appropriate guidance.

Details of the installation of the gas protection measures and the verification undertaken are provided in a Verification Report.

4.2. Risk Assessment

In general accordance with CIRIA C735 a risk-based verification approach should be utilised. The high-risk factor (non-skilled workforce) will be mitigated by following the procedure stated within this RS. Therefore, the proposed development is considered to be a **Low Risk**.

Table 4-1: Risk Assessment

Risk Factors	Risk Assessment		
	Low	Intermediate	High
Gas Regime – CS2			
Design Complexity – Simple			
No. of buildings proposed for site – Small <5			
Installation Workforce – Non-specialist			

4.3. Gas Protection Measure Construction Details

The development proposes the construction of the Margam Substation with associated infrastructure as presented in Appendix B. The assumed building is a combination of 'Type C and D' structures and as it is a combined structure, the worst case approach is used classifying the building as a 'Type C' structure.

In line with the requirements of Section 3.5.2 standard detailing showing the outline proposed gas protection measures are included in Appendix A.

4.4. Scope of Verification

The requirements for the scope of verification should use a risk-based system which takes into account factors that will influence the scope of the verification activities. Verification should consider the site-specific gas regime, the number of buildings that are being constructed, complexity of design, installation methodology and the qualification and experience of the workforce.

It is recommended that discussions with suppliers and installers regarding the combined scoring of the structural barrier and membrane are ongoing throughout the development to ensure the required scoring is achieved.

4.4.1. Proposed Verification Regime

Table 4-2 summarises the proposed verification and integrity testing that would typically be undertaken.

Table 4-2: Proposed Inspection Regime

Person	Requirements
Independent Verifier	Will conduct a thorough visual verification of the cast in-situ slab and the ventilation prior to use. Photographic evidence to be collected and inspection proforma to be prepared.
	To consider further need to any in-situ testing based on inspection findings i.e. leak detection. Results will be recorded on inspection proforma.
Contractor	Will provide the Independent Verifier with photographic evidence of slab installation and membrane installation.

In accordance with Section 3.2.3 of CIRIA C735 (Ref. [6]) verifiers should be competent, experienced and suitably trained and have immediate access to appropriate technical support where needed or necessary.

Prior to works, the Contractor should produce a detailed installation plan including method statement, Certified Quality Auditor (CQA) procedure and qualifications.

4.4.2. Structural Barrier

As set out in Section 3.5.2 it is proposed to use either a cast in-situ monolithic reinforced ground bearing raft, or a reinforced cast in-situ suspended floor slab (with minimal penetrations) for the GIS Hall, meeting the criteria for a point score of 1.

The Contractor should provide the independent verifier with photographic evidence of the slab installation.

4.4.3. Ventilation Barrier

As set out in Section 3.5.2 it is proposed to include a passive sub floor dispersal layer, with a clear void and or no fines gravel layer, for the Amenity Building, meeting the criteria for a point score of 1.5.

The Contractor should provide the independent verifier with photographic evidence of sub floor dispersal layer and the presence of a clear void and or no fines gravel layer.

4.4.4. Membrane

A gas resistance membrane should be installed by an operative who has or is working towards the Construction Skills NVQ Level 2 Diploma and installed as per the manufacturer's guidelines. The performance specification of the membrane should comply with Table 7 of BS8485:2015.

Additional measures are recommended to protect the membrane from impact, puncture, tearing or piercing. During storage the membrane should be kept on a flat, clean surface, under cover and away from direct sunlight or mechanical dangers. The membrane should not be installed in very cold temperatures (i.e. below 5°C).

Prior to installation all surfaces should be clean, dry, without debris and free from voids or sharps. Any of these could puncture the membrane and comprise the gas protection system. The membrane should be loosely laid to accommodate small movements resulting from settlement. Once laid, the membrane should be protected from damage prior to inspection.

Upon completion of the installation, it should be visually inspected and verified by a suitably qualified and experienced independent verifier. The visual inspection should include assessment of the adequacy of ground preparation and to avoid subsequent possible damage to the membrane. Particular attention should be given to laps, edges, the sealing of service entries and penetrations such as vents pipes and pile capes. The record keeping should be thorough and systematic.

Any discrepancies should be highlighted such as rips, tears, inadequate seals. If the gas membrane has a third-party accreditation the installer requirements should be checked against it. If welded joints are used the verifier should ensure these are correctly tested. Repairs should be undertaken on the same day, followed by the verification and inspection.

The membrane is proposed below a reinforced slab for the GIS Hall, and as such inspections should take place after reinforcement and before concrete pouring. The concrete should then be poured as soon as possible. Should there be significant time between the membrane installation and concrete pouring, additional visual inspection should take place before the concrete is poured to ensure that no damage to the membrane has occurred between the installation and the concrete pour.

Inspection reports with photographs should be produced and be included in the Verification Report.

As set out in Section 3.5.2 it is considered the membrane will achieve 2.0 points.

4.4.5. Proposed Development Programme

The programming of verification activities should reflect the final planning construction sequence. It is recommended that discussions with suppliers and installers regarding the combined scoring of the structural barrier and membrane are ongoing throughout the development to ensure the required scoring is achieved and evidenced.

Gas membrane protection between visits from the verifier should comply with Appendix A1 in CIRIA C735.

5. Verification Reporting Requirements

5.1. Verification Report

In accordance with CIRIA C735 / YALPAG guidance the Verification Report will include the following:

- Site details and Planning Application details.
- Summary of Gas Risk Assessment.
- Details of Verification Regime.
- Details of the Installers and relevant qualification.
- Details of the Verifier independency and relevant qualifications.
- Verifier proformas and integrity testing results.
- Description of protection measures installed with reference to method statements, drawings and manufacturers specifications.
- Visual inspection photographic evidence.
- Installer daily log inspection sheet.
- Details of non-conformities and how they were addressed.
- Confirmation the remedial objectives were achieved.
- Where necessary, further works and / or long-term maintenance

6. References

- [1] British Standards Institute, “BS10175:2011+A2:2017 - Code of Practice for Investigation of Potentially Contaminated Sites,” 2017.
- [2] Natural Resource Wales, “Land Contamination Risk Management (LCRM) 2020:2025,” 2025.
- [3] BakerHicks, “Ground Investigation Report: Margam Substation – Margam Connection MARPT-BH-01-XX-RP-G-090001,” 2025.
- [4] CIRIA, “CIRIA C665 - Assessing risks posed by hazardous ground gas to buildings,” 2007.
- [5] British Standards, “BS8485:2015+A1:2019 Code of practice for the design of proactive measures for methane and carbon dioxide ground gases for new buildings,” 2019.
- [6] CIRIA, “CIRIA C735 Good practice on the testing and verification of protection systems for buildings against hazardous ground gases,” 2014.
- [7] Yorkshire and Lincolnshire Pollution Advisory Group, “Development on Land Affected by Contamination - Technical Guidance for Developers, Landowners and Consultants,” 2023.
- [8] Bakerhicks, “Phase I Geo-Environmental Desk STUDY: Margam Substation MARPT-BHK-01-XX-RP-G-090005,” 2025.
- [9] BakerHicks, “Geotechnical desk study: Margam FEED 30004240-BHK-XX-XX-RP-C-0003,” March 2024.
- [10] BakerHicks, “Coal Mining Risk Assessment 30004240-BHK-XX-XX-RP-C-0004,” 2025.

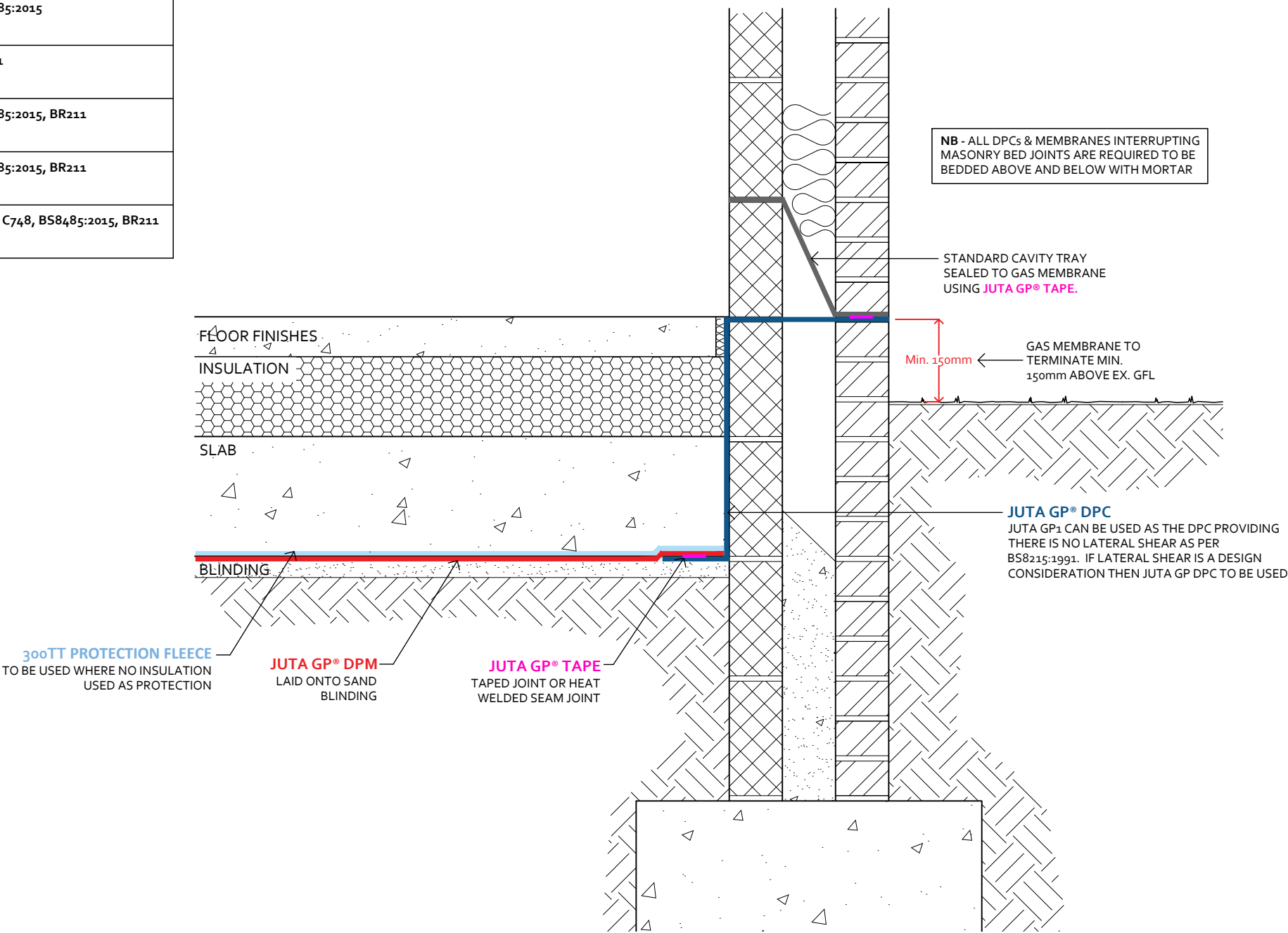
Appendix A. Gas Protection Measures

-Standard Detailing

-Typical CS-3 compliant gas protection membrane

GROUND GAS PROTECTION
GP® MEMBRANES - STANDARD DETAILS

PRODUCT NAMES (SYSTEM)	DESCRIPTION	STANDARD
JUTA GP®1 GAS RESISTANT DPM JUTA GP® DPC JUTA GP®1 SAM	BBA CERTIFIED GROUND GAS MEMBRANE (MH ₄ & CO ₂)	BS8485:2015
JUTA GP®4 GAS RESISTANT DPM JUTA GP® RADON DPC JUTA WP SAM	BBA CERTIFIED RADON RESISTANT DPM	BR211
JUTA GP®5 GAS RESISTANT DPM JUTA GP® DPC JUTA GP®1 SAM	BBA CERTIFIED GROUND GAS MEMBRANE (MH ₄ & CO ₂)	BS8485:2015, BR211
JUTA GP®5+ GAS RESISTANT DPM JUTA GP® DPC JUTA GP®1 SAM	BBA CERTIFIED GROUND GAS MEMBRANE (MH ₄ & CO ₂)	BS8485:2015, BR211
JUTA GP® TITANFLEX DPM JUTA GP® TITANTECH DPC JUTA GP® TITANTANK	BBA CERTIFIED HYDROCARBON & VOC DPM	CIRIA C748, BS8485:2015, BR211



DRAWING TITLE JUTA GP® GAS RESISTANT DPM GROUND BEARING RC SLAB, MEMBRANE BELOW SLAB PERIMETER TERMINATION DETAILS.			
DRAWING NUMBER TD-JUTA.GP_DPM.001			
DRAWN BY GG	CHECKED BY PD	SCALE (A3) NTS	ISSUE DATE 10.2024

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www: juta.co.uk

- NOTES**
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GROUND GAS PROTECTION
GP® MEMBRANES - STANDARD DETAILS

PRODUCT NAMES (SYSTEM)	DESCRIPTION	STANDARD
JUTA GP®1 GAS RESISTANT DPM JUTA GP® DPC JUTA GP®1 SAM	BBA CERTIFIED GROUND GAS MEMBRANE (MH ₄ & CO ₂)	BS8485:2015
JUTA GP®4 GAS RESISTANT DPM JUTA GP® RADON DPC JUTA WP SAM	BBA CERTIFIED RADON RESISTANT DPM	BR211
JUTA GP®5 GAS RESISTANT DPM JUTA GP® DPC JUTA GP®1 SAM	BBA CERTIFIED GROUND GAS MEMBRANE (MH ₄ & CO ₂)	BS8485:2015, BR211
JUTA GP®5+ GAS RESISTANT DPM JUTA GP® DPC JUTA GP®1 SAM	BBA CERTIFIED GROUND GAS MEMBRANE (MH ₄ & CO ₂)	BS8485:2015, BR211
JUTA GP® TITANFLEX DPM JUTA GP® TITANTECH DPC JUTA GP® TITANTANK	BBA CERTIFIED HYDROCARBON & VOC DPM	CIRIA C748, BS8485:2015, BR211

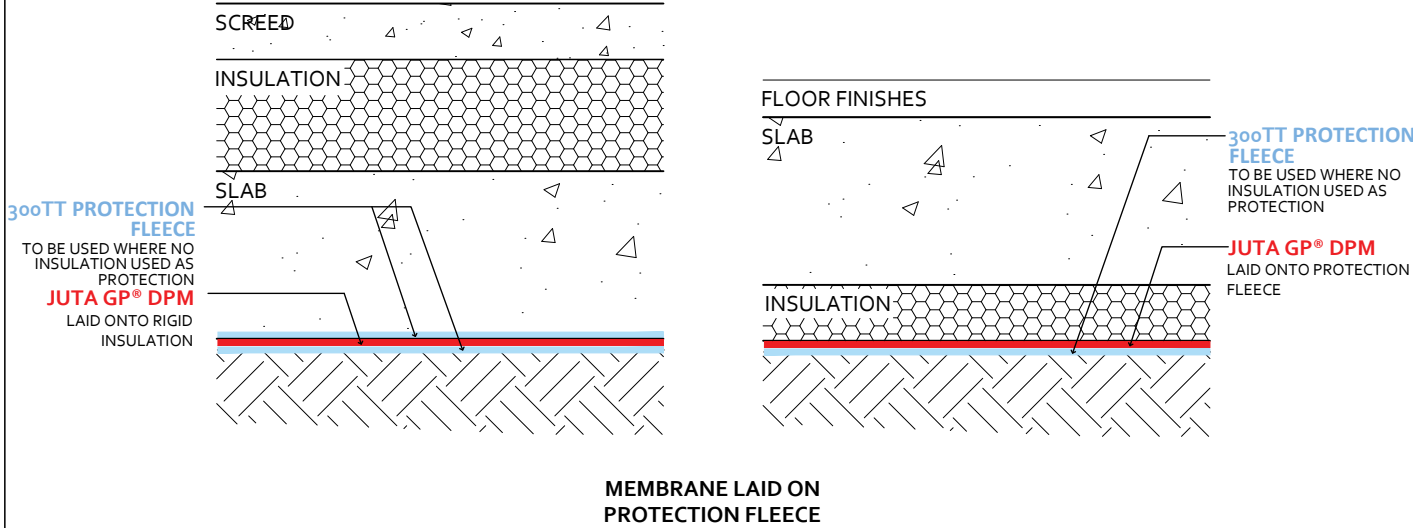
MEMBRANE BELOW SLAB BUILD-UP OPTIONS

JUTA GP MEMBRANES NEED TO BE LAID ONTO A SURFACE WHICH SHOULD BE SMOOTH, DRY, CLEAN AND FREE FROM DEBRIS OR DETRITUS MATERIAL WHICH MAY CAUSE DAMAGE TO THE BARRIER.

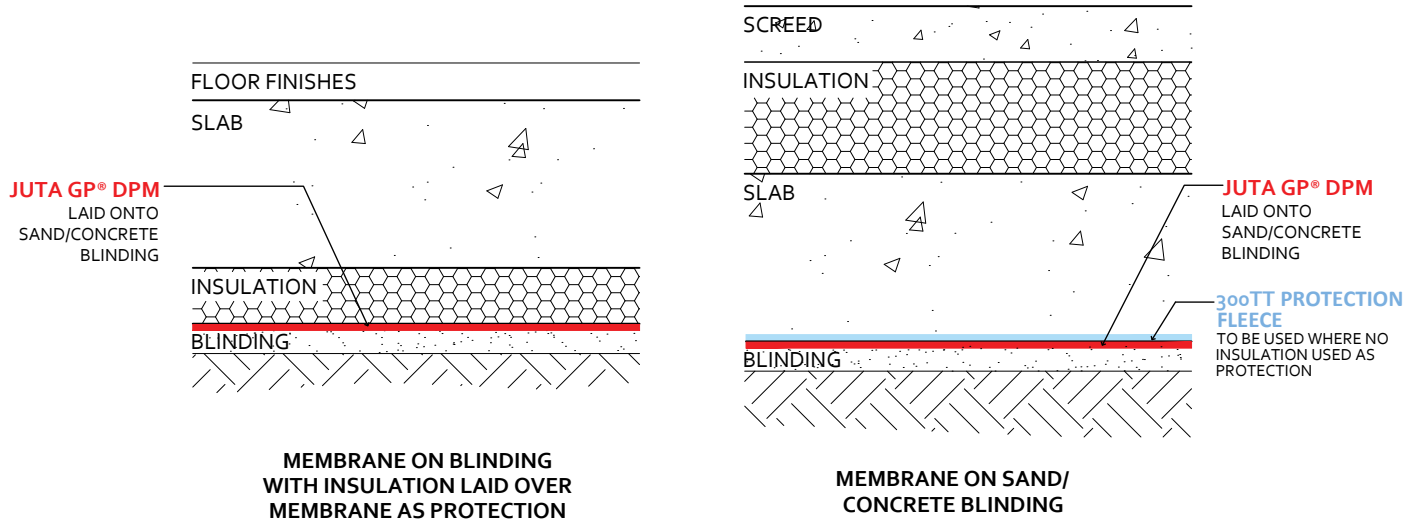
THIS CAN INCLUDE

- SAND BLINDING,
- SMOOTH CEMENT BLINDING,
- RIGID INSULATION,
- 300tt PROTECTION FLEECE

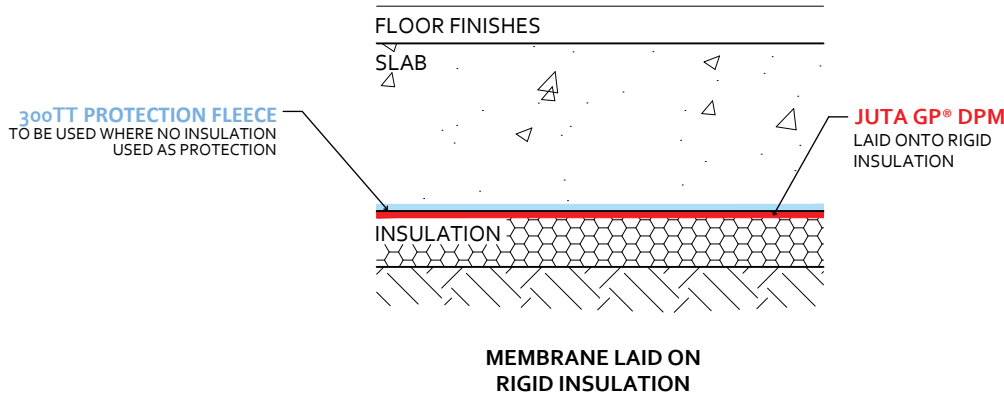
EARTH & FLEECE



SAND / CEMENT BLINDING



INSULATION



DRAWING TITLE
JUTA GP® GAS RESISTANT DPM
SLAB BUILD-UP OPTIONS - MEMBRANE BELOW SLAB

DRAWING NUMBER
TD-JUTA.GP_DPM.044

DRAWN BY
GG

CHECKED BY
PD

SCALE (A3)
NTS

ISSUE DATE
01.2025

JUTA UK
MELTON GROVE WORKS
BLACKPOOL ROAD
LYTHAM
FY8 5PL

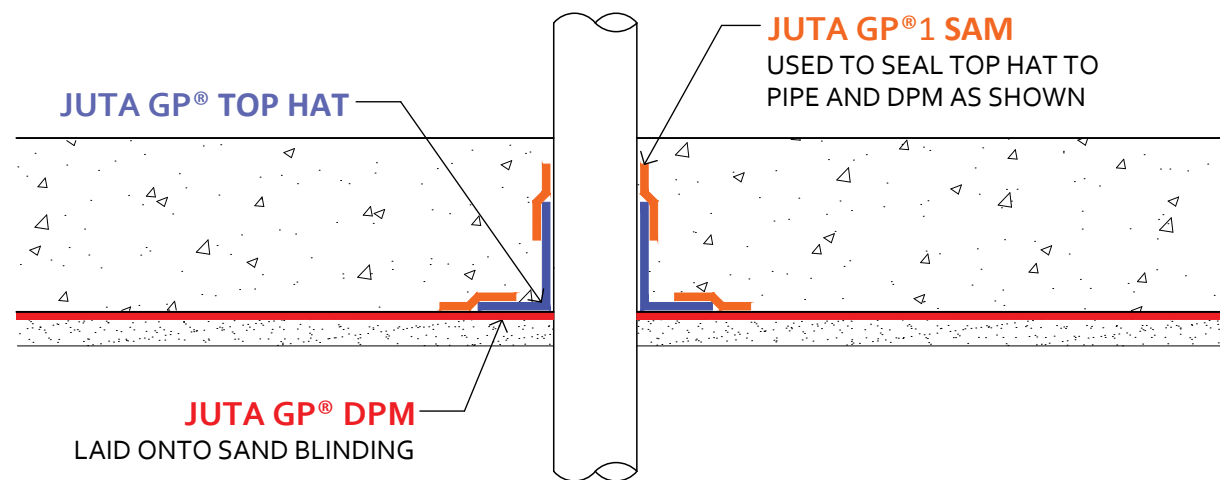
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Email: info@juta.co.uk
www: juta.co.uk

NOTES

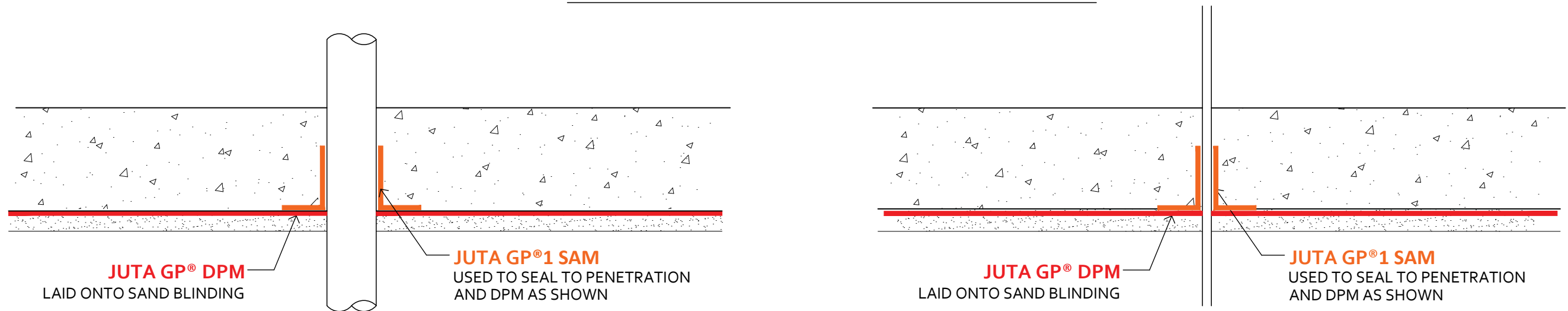
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TITANTECH®



PIPE PENETRATION WITH TOP HAT DETAIL



**PIPE PENETRATION WITH SELF
ADHESIVE GAS MEMBRANE**

**ROD/ REBAR/ HANGAR WITH SELF ADHESIVE
GAS MEMBRANE**

DRAWING TITLE **JUTA GP® GAS RESISTANT DPM**
PIPE PENETRATION DETAILS - MEMBRANE BELOW SLAB

DRAWING NUMBER **TD-JUTA.GP_DPM.046**

DRAWN BY GG	CHECKED BY PD	SCALE (A3) NTS	ISSUE DATE 02.2025
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JUTA



TITANTECH®



GP[®]1

GP[®]1 proprietary gas resistant damp proof membrane (DPM) is a multi-layer, low density polyethylene membrane, reinforced with a polypropylene reinforcing grid with an integral aluminium foil for protection against methane, carbon dioxide, radon, ground gas, air & moisture.

Features and benefits:

- High quality reinforced membrane.
- Low permeability to hydrocarbon and VOC vapours, carbon dioxide, methane and radon.
- Complies with latest codes of practice as published by the BRE and CIRIA, and BS 8485.

Can be used on any site in accordance with BS8485:2015 and NHBC requirements where carbon dioxide, methane or radon is present up to and including CIRIA 665 SITUATION 6. The barrier is sufficiently resistant to the ingress of harmful gasses into a building. On more heavily contaminated sites a passive or active venting system may be required to dilute the gasses down to acceptable levels and specific design advice should be sought.

Accessory Products

- GP[®]1 SAM
- GP[®] DPC
- 300TT
- GP[®] Tape
- GP[®] Lap Tape

Physical Properties

Thickness	0.6 mm
Width	2 m
Length	50 m
Weight	370 g/m ²

Gas Permeability

Methane	< 0.09
Carbon Dioxide	< 0.09
Radon	8.0 x 10 ⁻¹⁵

Compliance and Certification

CE MARK - EN13967:2015
NHBC Standards Compliant
B58485:2015 + A1 2019 Accordant
BBA Certified - Certificate No. 20/5728 P1

Specification Clauses

Uniclass 2015 - PR_25_57_65_90
Plastic Sheets

CAW5 - J40/145 Loose laid weldable polyethylene gas retardant damp proofing
J40/140 loose laid plastics or rubber sheet gas retardant damp proofing

D21/350 Gas retardant membrane

Certifications



Please
Scan

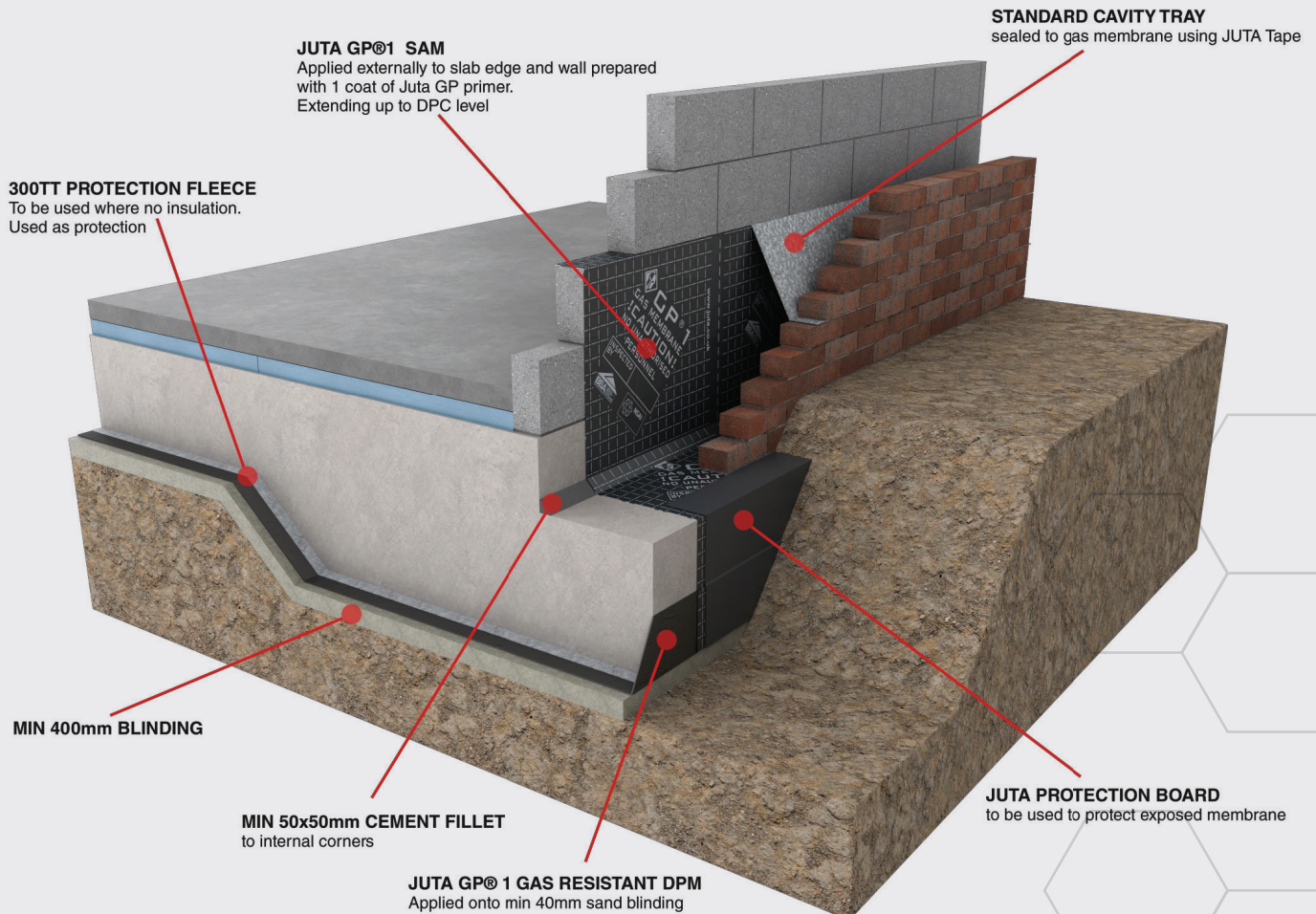


Rev 2024



Standard Detail - Ground Bearing Raft Slab

NB- All DPC's & membranes interrupting masonry bed joints are required to be bedded above and below with mortar.



Various typical details available on request. Please contact **technical@juta.co.uk** for further information



Standard Detail - Ground Bearing Slab

NB- All DPC's & membranes interrupting masonry bed joints are required to be bedded above and below with mortar.

300TT PROTECTION FLEECE
To be used where no insulation.
Used as protection

STANDARD CAVITY TRAY
sealed to gas membrane using JUTA Tape

BLINDING

JUTA GP DPC
Juta GP1 can be used as the DPC providing there is no lateral shear as per BS8215:1991. If lateral shear is a design consideration then Juta GP DPC to be used

JUTA GP® TAPE
Taped joint or heat welded seam joint

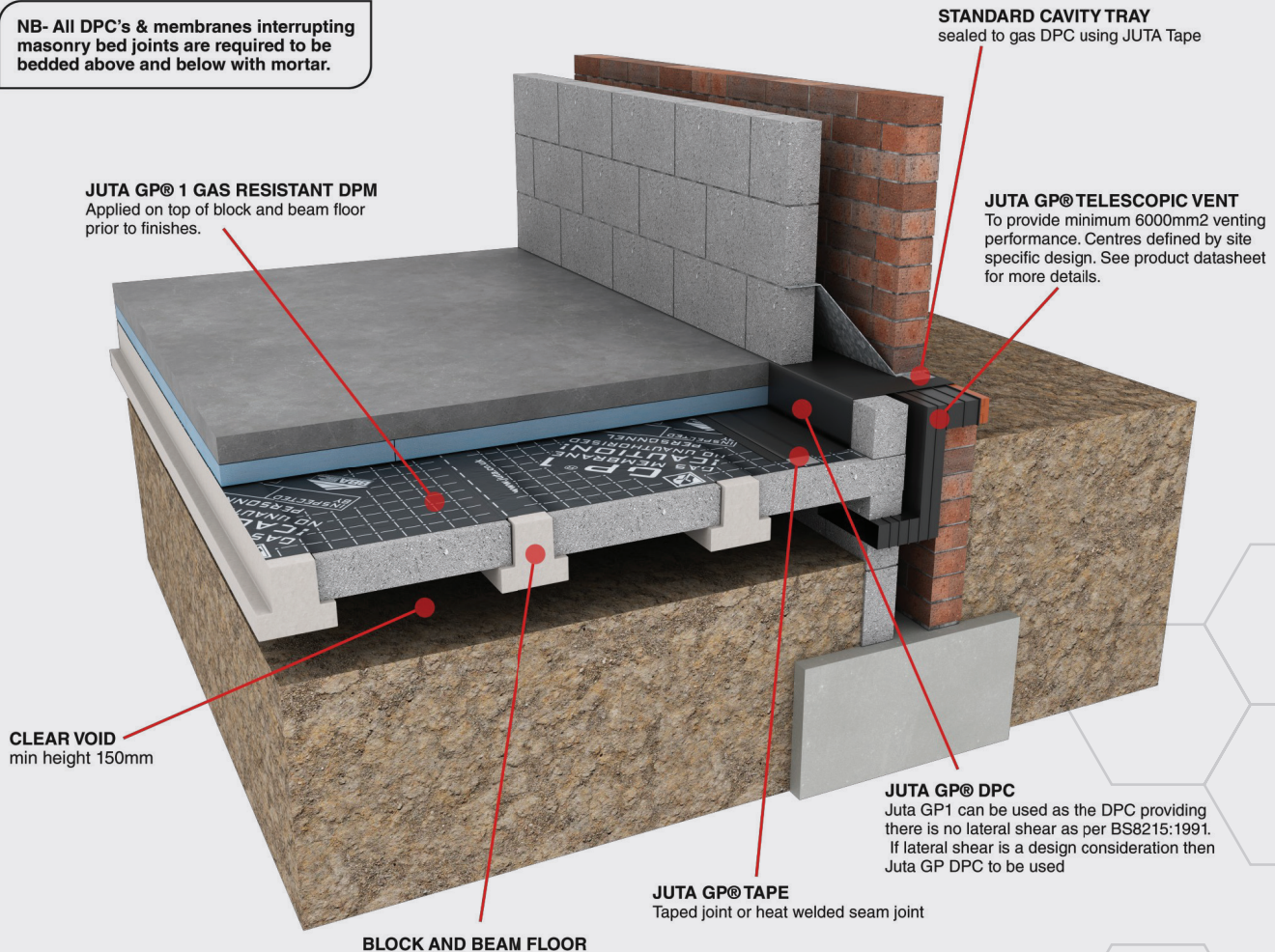
JUTA GP® 1 GAS RESISTANT DPM
Applied onto min 400mm sand blinding

Various typical details available on request. Please contact **technical@juta.co.uk** for further information



Standard Detail - Ground Block & Beam Flooring

NB- All DPC's & membranes interrupting masonry bed joints are required to be bedded above and below with mortar.



Various typical details available on request. Please contact **technical@juta.co.uk** for further information

Juta UK Ltd

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Lytham FY8 5PL

Tel: 01772 754177

e-mail: info@juta.co.uk

website: www.juta.co.uk



Agrément Certificate

20/5728

Product Sheet 1 Issue 2

JUTA GAS-RESISTANT AND DAMP PROOFING MEMBRANES

GP1 GAS BARRIER

This Agrément Certificate Product Sheet⁽¹⁾ relates to the GP1 Gas Barrier, for use as a damp-proof membrane and a gas-resistant membrane in concrete ground floors, above and below slabs not subject to hydrostatic pressure, to protect the building against moisture, radon, methane and carbon dioxide from the ground.

(1) Hereinafter referred to as 'Certificate'.

The assessment includes

Product factors:

- compliance with Building Regulations
- compliance with additional regulatory or non-regulatory information where applicable
- evaluation against technical specifications
- assessment criteria and technical investigations
- uses and design considerations

Process factors:

- compliance with Scheme requirements
- installation, delivery, handling and storage
- production and quality controls
- maintenance and repair

Ongoing contractual Scheme elements†:

- regular assessment of production
- formal 3-yearly review



KEY FACTORS ASSESSED

- Section 1. Mechanical resistance and stability
- Section 2. Safety in case of fire
- Section 3. Hygiene, health and the environment
- Section 4. Safety and accessibility in use
- Section 5. Protection against noise
- Section 6. Energy economy and heat retention
- Section 7. Sustainable use of natural resources
- Section 8. Durability

The BBA has awarded this Certificate to the company named above for the product described herein. This product has been assessed by the BBA as being fit for its intended use provided it is installed, used and maintained as set out in this Certificate.

On behalf of the British Board of Agrément

Date of Second issue: 16 May 2024

Originally certified on 11 March 2020

Hardy Giesler
Chief Executive Officer

This BBA Agrément Certificate is issued under the BBA's Inspection Body accreditation to ISO/IEC 17020. Sections marked with † are not issued under accreditation.

The BBA is a UKAS accredited Inspection Body (No. 4345), Certification Body (No. 0113) and Testing Laboratory (No. 0357).

Readers MUST check that this is the latest issue of this Agrément Certificate by either referring to the BBA website or contacting the BBA directly.

The Certificate should be read in full as it may be misleading to read clauses in isolation.

Any photographs are for illustrative purposes only, do not constitute advice and should not be relied upon.

British Board of Agrément

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Croxley Park, Watford
Herts WD18 8YG

©2024

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www.bbacerts.co.uk

SUMMARY OF ASSESSMENT AND COMPLIANCE

This section provides a summary of the assessment conclusions; readers should refer to the later sections of this Certificate for information about the assessments carried out.

Compliance with Regulations

Having assessed the key factors, the opinion of the BBA is that the GP1 Gas Barrier, if installed, used and maintained in accordance with this Certificate, can satisfy or contribute to satisfying the relevant requirements of the following Building Regulations:



The Building Regulations 2010 (England and Wales) (as amended)

Requirement:	C1(2)	Site preparation and resistance to contaminants
Comment:		The product can contribute to satisfying this Requirement. See section 3 of this Certificate.
Requirement:	C2(a)	Resistance to moisture
Comment:		The product, including joints, can contribute to a construction satisfying this Requirement. See section 3 of this Certificate.
Regulation:	7(1)	Materials and workmanship
Comment:		The product is acceptable. See sections 8 and 9 of this Certificate.



The Building (Scotland) Regulations 2004 (as amended)

Regulation:	8(1)	Fitness and durability of materials and workmanship
Comment:		The product is acceptable. See sections 8 and 9 of this Certificate.
Regulation:	9	Building standards – construction
Standard:	3.1	Site preparation – harmful and dangerous substances
Standard:	3.2	Site preparation – protection from radon gas
Comment:		The product can contribute to satisfying the requirements of these Standards, with reference to clauses 3.1.2 ⁽¹⁾⁽²⁾ and 3.1.6 ⁽¹⁾⁽²⁾ . See section 3 of this Certificate.
Standard:	3.4	Moisture from the ground
Comment:		The product will enable a structure to satisfy the requirements of this Standard, with reference to clauses 3.4.1 ⁽¹⁾⁽²⁾ , 3.4.2 ⁽¹⁾⁽²⁾ , 3.4.5 ⁽¹⁾⁽²⁾ and 3.4.7 ⁽¹⁾⁽²⁾ . See section 3 of this Certificate.
Standard:	7.1(a)	Statement of sustainability
Comment:		The product can contribute to satisfying the relevant requirements of Regulation 9, Standards 1 to 6, and therefore will contribute to a construction meeting a bronze level of sustainability as defined in this Standard.
Regulation:	12	Building standards – conversion
Comment:		Comments in relation to the product under Regulation 9, Standards 1 to 6, also apply to this Regulation, with reference to clause 0.12.1 ⁽¹⁾⁽²⁾ and Schedule 6 ⁽¹⁾⁽²⁾ .

(1) Technical Handbook (Domestic).

(2) Technical Handbook (Non-Domestic).



The Building Regulations (Northern Ireland) 2012 (as amended)

Regulation:	23(a)(i)	Fitness of materials and workmanship
Comment:	(iii)(b)(i)	The product is acceptable. See sections 8 and 9 of this Certificate.
Regulation:	26(1)(b)(2)	Site preparation and resistance to contaminants
Comment:		The product will contribute to satisfying this Regulation. See section 3 of this Certificate.
Regulation:	28(a)	Resistance to moisture and weather
Comment:		The product will enable a structure to satisfy this Regulation. See section 3 of this Certificate.

Additional Information

NHBC Standards 2024

In the opinion of the BBA, the GP1 Gas Barrier, if installed, used and maintained in accordance with this Certificate, can satisfy or contribute to satisfying the relevant requirements in relation to NHBC Standards, Technical Requirement R3 and Chapters 4.1 *Land quality – managing ground conditions*, 5.1 *Substructure and ground bearing floors* and 5.2 *Suspended ground floors*.

Fulfilment of Requirements

The BBA has judged the GP1 Gas Barrier to be satisfactory for use as described in this Certificate. The product has been assessed as a damp-proofing membrane and a gas-resistant membrane, for use in concrete ground floors above and below slabs not subject to hydrostatic pressure, to protect the building against moisture, radon, methane and carbon dioxide from the ground.

ASSESSMENT

Product description and intended use

The Certificate holder provided the following description for the product under assessment.

The GP1 Gas Barrier consists of layers of low-density polyethylene (LDPE) membrane, reinforced with a polypropylene reinforcing grid with an integral aluminium foil.

The product has the nominal characteristics given in Table 1.

Table 1 Nominal characteristics of the GP1 Gas Barrier

Characteristic (unit)	GP1 Gas Barrier
Thickness (mm) (including reinforcement scrim)	0.6
Thickness (mm) (measured between the reinforcement scrim)	0.4
Roll length (m)	Various
Roll width (m)	Various
Mass per unit area (g·m ⁻²)	370

Ancillary items

The following ancillary items are essential to use with the product and have been assessed with the product:

- butyl or bitumen tape — for use at joints and laps
- jointing tape — for securing laps and joints.

The Certificate holder recommends the following ancillary items for use with the product, but these materials have not been assessed by the BBA and are outside the scope of this Certificate:

- GP Top Hats — to seal around entry points to the membrane
- GP Internal Corner Cloaks — prefabricated corner details
- GP External Corner Cloaks — prefabricated corner details
- GP Primer — used to provide adhesion for application of bitumen-enhanced geomembranes
- GP Void Vent 25 — used to provide ventilation
- GP Void Vent 40 — used to provide ventilation
- GP Protection Fleece — to form a protective layer to prevent damage to the membrane
- GP-SAM — a self-adhesive membrane
- GP DPC — a damp-proof course (DPC).

Definitions for products and applications inspected

A gas-resistant membrane is defined for the purpose of this Certificate as a membrane placed above, below or within the floor slab construction to restrict methane and carbon dioxide migration from the ground into a building (as defined in BS 8485 : 2015).

Product assessment – key factors

The product was assessed for the following key factors, and the outcome of the assessments is shown below. Conclusions relating to the Building Regulations apply to the whole of the UK unless otherwise stated.

1 Mechanical resistance and stability

Data were assessed for the following characteristics.

1.1 Structural and mechanical properties

1.1.1 Results of tests for mechanical properties are given in Table 2.

Table 2 Results of mechanical properties tests

Product assessed	Assessment method	Requirement	Result
GP1 Gas Barrier	Tensile strength to BS EN 12311-1 : 2000 Control	Value achieved	
	longitudinal direction transverse direction		530 N·(50mm) ⁻¹ 431 N·(50mm) ⁻¹
GP1 Gas Barrier	Elongation to BS EN 12311-1 : 2000 Control	Value achieved	
	longitudinal direction transverse direction		17% 20%
GP1 Gas Barrier	Foldability at low temperature to BS EN 495-5 : 2001	Value achieved	
		Upper face Lower face	-40°C -40°C

1.1.2 On the basis of the data assessed, the product can be punctured by sharp objects and care must be taken when handling building materials over the exposed surface.

1.1.3 Provided there are no sharp objects present on the membrane's surface prior to and during installation of the protective layer, the product will not be damaged by normal foot traffic.

1.1.4 The product will remain flexible at temperatures likely to occur in practice.

2 Safety in case of fire

Not applicable.

3 Hygiene, health and the environment

Data were assessed for the following characteristics.

3.1 Weathertightness and damp-proofing

3.1.1 Results of weathertightness and damp-proofing tests are given in Table 3.

<i>Table 3 Results of weathertightness tests</i>			
Product assessed	Assessment method	Requirement	Result
GP1 Gas Barrier	Watertightness to BS EN 1928 : 2000	No leakage after 24 hours	Pass
GP1 Gas Barrier	Water vapour permeability to BS 3177 : 1959 ⁽¹⁾	Value achieved	0.02 g.m ⁻² .24h ⁻¹
A representative related product	Shear resistance of joints	Value achieved	
	Control		
	butyl joint welded joint to BS EN 12317-2 : 2010		251 N.(50mm) ⁻¹ 343 N.(50mm) ⁻¹

(1) Testing was carried out before harmonised European Standard EN 1931 : 2000 was published.

3.1.2 On the basis of data assessed, the GP1 Gas Barrier, including joints, provides an effective barrier to the passage of liquid moisture from the ground.

3.1.3 The membrane is impervious to water and provides a waterproofing layer capable of accepting minor structural movements without damage.

3.2 Resistance to underground gases

3.2.1 Results of resistance to hazardous ground gases tests are given in Table 4.

<i>Table 4 Results of resistance to hazardous ground gases tests</i>			
Product assessed	Assessment method	Requirement	Result
GP1 Gas Barrier	Methane permeability to BS ISO 15105-1 : 2007	As per BS 8485 : 2015 <40 ml.m ⁻² .d ⁻¹ .atm ⁻¹	<0.09 ml.m ² day ⁻¹ .atm ⁻¹
GP1 Gas Barrier	Carbon dioxide permeability to BS ISO 15105-1 : 2007	Value achieved	<0.09 ml.m ² day ⁻¹ .atm ⁻¹
GP1 Gas Barrier	Radon permeability to K124/02/95	Value achieved	8.0 x 10 ⁻¹⁵ m ² .s ⁻¹

3.2.2 On the basis of data assessed, the GP1 Gas Barrier will restrict the ingress of radon, methane and carbon dioxide into buildings from landfill and naturally occurring sources and will satisfy the performance for a gas-resistant membrane as defined in BS 8485 : 2015.

4 Safety and accessibility in use

Not applicable.

5 Protection against noise

Not applicable.

6 Energy economy and heat retention

Not applicable.

7 Sustainable use of natural resources

The product contains polyethylene, which can be recycled.

8 Durability

8.1 The potential mechanisms for degradation and the known performance characteristics of the materials in this product were assessed.

8.2 Specific test data were assessed for the following.

Table 5 Results of durability tests

Product assessed	Assessment method	Requirement	Result
GP1 Gas Barrier	Tensile strength to BS EN 12311-1 : 2000 Longitudinal direction		
	Heat aged at 70°C for 84 days	No significant loss of properties	Pass
	UV aged at 50°C for 100 hours UVB	following ageing	Pass
	Tensile strength to BS EN 12311-1 : 2000 Transverse direction		
GP1 Gas Barrier	Heat aged at 70°C for 84 days	No significant loss of properties	Pass
	UV aged at 50°C for 100 hours UVB	following ageing	Pass
	Elongation to BS EN 12311-1 : 2000 Longitudinal direction		
	Heat aged at 70°C for 84 days	No significant loss of properties	Pass
GP1 Gas Barrier	UV aged at 50°C for 100 hours UVB	following ageing	Pass
	Elongation to BS EN 12311-1 : 2000 Transverse direction		
	Heat aged at 70°C for 84 days	No significant loss of properties	Pass
	UV aged at 50°C for 100 hours UVB	following ageing	Pass
GP1 Gas Barrier	Watertightness to BS EN 1928 : 2000	No leakage after 24 hours	Pass
GP1 Gas Barrier	Heat aged at 70°C for 84 days		
	Dimensional stability to BS EN 1107-2 : 2001 Longitudinal direction	Value achieved	-0.5%
	Transverse direction		-0.3%

8.3 Service life

8.3.1 Under normal service conditions, the product will have a life at least as long as the building in which it is installed, provided it is designed and installed in accordance with this Certificate and the Certificate holder's instructions.

8.3.2 The product will not be significantly affected by short term exposure to ultraviolet (UV) light. However, long periods of exposure may reduce the effectiveness of the membrane and it must be protected from UV light as soon as practicable after it is installed.

Information provided by the Certificate holder was assessed for the following factors:

9 Design, installation, workmanship and maintenance

9.1 Design

9.1.1 The design process was assessed by the BBA, against the requirements of BS 8000-4 : 1989, BS 8485 : 2015, CP 102 : 1973 Section 3, this Certificate and the Certificate holder's instructions, and the following requirements apply in order to satisfy the performance assessed in this Certificate.

9.1.2 The design of a gas protection system must be carried out by a suitably experienced and competent individual with sufficient knowledge of ground gas risk and the construction methods and materials.

9.1.3 The continuity of the gas protection must extend over the footprint of the building, and the product must be sealed to a gas-resistant DPC where applicable.

9.1.4 The membrane contains an aluminium foil interlayer which may be subject to corrosion by alkaline conditions if damage to the membrane and exposure occurs. However, under normal circumstances, the polyethylene faces of the membrane are compatible with other materials and products typically used in the same areas, with the exception of those containing pitch.

9.1.5 Where the construction is subject to NHBC requirements, reference must be made to NHBC NF 94 *Hazardous Ground gas – an essential guide for housebuilders*.

9.2 Installation

9.2.1 Installation instructions provided by the Certificate holder were assessed and judged to be appropriate and adequate.

9.2.2 Installation must be carried out in accordance with this Certificate and the Certificate holder's instructions following the relevant guidance given in BRE Report BR 211 : 2023, BS 8485 : 2015 and NHBC NF 94.

9.2.3 All gas membrane installation must be subject to third-party independent validation, in accordance with BS 8485 : 2015.

9.2.4 The product can be installed in all normal site conditions, provided that the air temperature is not below 5°C and the membrane is free from condensation.

9.2.5 The surface onto which the product is to be laid must be dry and free from sharp protrusions and debris that could damage the membranes. Surfaces must be free from dust and frost.

9.2.6 The product must normally only be installed over a surface that has a smooth finish, ie it must be free from voids, projections and mortar deposits (see section 9.2.9).

9.2.7 For gas-resistant applications, the membrane must be installed either with hot air welded or taped joints in accordance with the Certificate holder's instructions.

9.2.8 The product must be protected as soon as possible after installation to minimise direct foot trafficking. Direct trafficking by vehicles must be avoided.

9.2.9 Unless the base is smooth, a surface blinding of soft sand (or similar material) must be used to prevent puncturing during installation or when concrete screed is being placed.

9.2.10 If the membrane is installed below a reinforced floor or concrete slab, it must be covered with a screed or protection layer prior to the positioning of the reinforcement.

9.2.11 If the membrane is above the slab, installation must be delayed until just before the laying of the screed or flooring, to avoid damage from site traffic.

Procedure

Hot air welded joints

9.2.12 The membrane is rolled out with the printed side uppermost, ensuring that it is properly aligned. All end and side overlaps must be a minimum of 100 mm and laps must be staggered.

9.2.13 Before welding work is carried out, trials must be completed to determine the 'operating window' for the welding equipment, materials and ambient conditions. Typically, the operating window will be between 180 and 240°C at a rate of 1.5 m·min⁻¹. In case of doubt, the Certificate holder must be consulted for advice, but such advice is outside the scope of this Certificate.

9.2.14 Weld widths must be a minimum of 50 mm and must be checked for integrity after being formed.

9.2.15 All service penetrations and direction changes must be properly detailed in accordance with the Certificate holder's instructions. Service ducts must be vented to prevent the possibility of gas accumulating in confined spaces.

9.2.16 The membrane must be covered by a screed or other protective layer as soon as possible after installation. If blockwork protection is used, care must be taken to avoid damage to the membrane during construction.

Taped joints

9.2.17 For use in damp-proofing applications, the membrane must be jointed using butyl or bitumen tape.

9.2.18 After laying the first sheet, the protective release film on one side of the tape is removed and the tape applied to the clean membrane sheet along a 100 mm guide line from the edge.

9.2.19 The second layer of membrane must be unrolled over the first layer, ensuring an overlap of 150 mm, before rolling with a silicone roller to remove any trapped air.

9.2.20 The joint can then be finished with a suitable sealing tape applied over the joint to provide a smooth finish.

9.3 Workmanship

9.3.1 To achieve the performance described in this Certificate, installation of the GP1 Gas Barrier must be carried out by installers trained by the Certificate holder.

9.3.2 The BBA operates an Approved Installer Scheme for gas membranes; details of approved installer companies are included on the BBA website (www.bbacerts.co.uk).

9.4 Maintenance and repair

9.4.1 As the product is confined within the structure and has suitable durability, maintenance is not required. However, any damage occurring before enclosure must be repaired.

9.4.2 Any damage to the membrane must be repaired using a patch of the membrane, and laps welded or sealed with double-sided tape and secured with the butyl tape. All patched areas must extend a minimum of 100 mm from the damaged area.

9.4.3 If required by the local authority, the adequacy of repair work must be confirmed by an independent validation report.

10 Manufacture

10.1 The production processes for the product have been assessed, and provide assurance that the quality controls are satisfactory according to the following factors:

10.1.1 The manufacturer has provided documented information on the materials, processes, testing and control factors.

10.1.2 The quality control operated over batches of incoming materials has been assessed and deemed appropriate and adequate.

10.1.3 The quality control procedures and product testing to be undertaken have been assessed and deemed appropriate and adequate.

10.1.4 The process for management of non-conformities has been assessed and deemed appropriate and adequate.

10.1.5 An audit of each production location was undertaken, and it was confirmed that the production process was in accordance with the documented process, and that equipment has been properly tested and calibrated.

†10.2 The BBA has undertaken to review the above measures on a regular basis through a surveillance process, to verify that the specifications and quality control operated by the manufacturer are being maintained.

11 Delivery and site handling

11.1 The Certificate holder stated that the product is delivered to site in rolls wrapped in polythene film. Each roll bears a leaflet describing the membrane and installation details. The BBA logo and the number of this Certificate are printed on the leaflet and pallet label.

11.2 Delivery and site handling must be performed in accordance with the Certificate holder's instructions and this Certificate, including:

11.2.1 Rolls must be stacked on a flat surface, kept under cover and protected from sunlight and mechanical damage.

ANNEX A – SUPPLEMENTARY INFORMATION †

Supporting information in this Annex is relevant to the product but has not formed part of the material assessed for the Certificate.

Construction (Design and Management) Regulations 2015

Construction (Design and Management) Regulations (Northern Ireland) 2016

Information in this Certificate may assist the client, designer (including Principal Designer) and contractor (including Principal Contractor) to address their obligations under these Regulations.

UKCA marking

The Certificate holder has taken the responsibility of UKCA marking the product in accordance with Designated Standard EN 13967 : 2012.

CE marking

The Certificate holder has taken the responsibility of CE marking the product in accordance with harmonised European Standard EN 13967 : 2012.

Management Systems Certification for production

The management system of the manufacturer has been assessed and registered as meeting the requirements of ČSN EN ISO 9001 : 2016 and ČSN EN ISO 14001 : 2016 by Bureau Veritas (Certificates CZ006792-1 and CZ002815-1 respectively).

Additional Guidance

A.1 There will be no adverse effect on the membrane from the underfloor heating under normal service conditions. In other circumstances, the Certificate holder's advice should be sought, but such advice is outside the scope of this Certificate.

A.2 Additional guidance on the use of damp-proof material is available in CP 102 : 1973, BS 8000-0 : 2014 and BS 8000-4 : 1989.

Bibliography

BRE Report BR 211 : 2023 *Radon : Guidance on protective measures for new buildings*

BS 3177 : 1959 *Water vapour permeability to water vapour of flexible sheet materials used for packaging*

BS 8000-0 : 2014 *Workmanship on construction sites — Introduction and general principles*

BS 8000-4 : 1989 *Workmanship on building sites — Code of practice for waterproofing*

BS 8485 : 2015 + A1 : 2019 *Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings*

BS EN 495-5 : 2001 *Flexible sheets for waterproofing — Determination of foldability at low temperature — Plastic and rubber sheets for roof waterproofing*

BS EN 1107-2 : 2001 *Flexible sheets for waterproofing — Determination of dimensional stability*

BS EN 1928 : 2000 *Flexible sheets for waterproofing — Bitumen, plastic and rubber sheets for roof waterproofing — Determination of watertightness*

BS EN 12311-1 : 2000 *Flexible sheets for waterproofing — Determination of tensile properties — Plastic and rubber sheets for roof waterproofing*

BS EN 12317-2 : 2010 *Flexible sheets for waterproofing — Determination of shear resistance of joints Part 2: Plastic and rubber sheets for roof waterproofing*

BS ISO 15105-1 : 2007 *Plastics — Film and sheeting — Determination of gas-transmission rate — Differential-pressure methods*

CP 102 : 1973 *Code of practice for protection of buildings against water from the ground*

ČSN EN ISO 9001 : 2016 *Quality management systems — Requirements*

ČSN EN ISO 14001 : 2016 *Environmental management systems — Requirements with guidance for use*

EN 13967 : 2012 *Flexible sheets for waterproofing — Plastic and rubber damp proof sheets including plastic and rubber basement tanking sheet — Definitions and characteristics*

K124/02/95 *Radon diffusion coefficient by Czech Technical University to test number 124-11 — Measurement of radon coefficient*

NHBC NF 94 *Hazardous ground gas – an essential guide for housebuilders*

Conditions of Certificate

Conditions

1 This Certificate:

- relates only to the product that is named and described on the front page
- is issued only to the company, firm, organisation or person named on the front page – no other company, firm, organisation or person may hold or claim that this Certificate has been issued to them
- is valid only within the UK
- has to be read, considered and used as a whole document – it may be misleading and will be incomplete to be selective
- is copyright of the BBA
- is subject to English Law.

2 Publications, documents, specifications, legislation, regulations, standards and the like referenced in this Certificate are those that were current and/or deemed relevant by the BBA at the date of issue or reissue of this Certificate.

3 This Certificate will be displayed on the BBA website, and the Certificate Holder is entitled to use the Certificate and Certificate logo, provided that the product and its manufacture and/or fabrication, including all related and relevant parts and processes thereof:

- are maintained at or above the levels which have been assessed and found to be satisfactory by the BBA
- continue to be checked as and when deemed appropriate by the BBA under arrangements that it will determine
- are reviewed by the BBA as and when it considers appropriate.

4 The BBA has used due skill, care and diligence in preparing this Certificate, but no warranty is provided.

5 In issuing this Certificate the BBA is not responsible and is excluded from any liability to any company, firm, organisation or person, for any matters arising directly or indirectly from:

- the presence or absence of any patent, intellectual property or similar rights subsisting in the product or any other product
- the right of the Certificate holder to manufacture, supply, install, maintain or market the product
- actual installations of the product, including their nature, design, methods, performance, workmanship and maintenance
- any works and constructions in which the product is installed, including their nature, design, methods, performance, workmanship and maintenance
- any loss or damage, including personal injury, howsoever caused by the product, including its manufacture, supply, installation, use, maintenance and removal
- any claims by the manufacturer relating to UKCA marking and CE marking.

6 Any information relating to the manufacture, supply, installation, use, maintenance and removal of this product which is contained or referred to in this Certificate is the minimum required to be met when the product is manufactured, supplied, installed, used, maintained and removed. It does not purport in any way to restate the requirements of the Health and Safety at Work etc. Act 1974, or of any other statutory, common law or other duty which may exist at the date of issue or reissue of this Certificate; nor is conformity with such information to be taken as satisfying the requirements of the 1974 Act or of any statutory, common law or other duty of care.

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Appendix B. Proposed Development Plan





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