Gas Protection Design Report

Site: Hinchley Road, Charlestown
Reference: 17-994-R5-3
Date: October 26



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E3P DRAWINGS LIST

17-994-002	Proposed Development Plan
17-994-006	Exploratory Hole Location Plan
17-994-034	Depth and Thickness of Peat Plan
17-994-037	Retained Peat Plan
17-994-038	Gas Monitoring Plan
17-994-042	Gaz Zoning Plan

1. BACKGROUND

Miller Homes have instructed E3P to prepare a Gas Protection Design Report (GPDR) for their site on Hinchley Road, Charlestown to document the mitigation measures and verification requirements to ensure compliance with the approved Remediation Strategy and ensure that relevant planning conditions are met and can be subsequently discharged.

The site has been subject to numerous phases of Site Investigation, which informed the development of the Conceptual Site Model (Ref: 17-994-R1-1) and, ultimately, the ground gas risk assessment (Ref: 17-994-R2-1), all reports for the site are summarised in Table 1.1.

These documents have been reviewed by the Local Planning Authority (LPA) and the Environment Agency (EA), and the subsequent remediation work incorporating the associated building phase mitigation measures has been approved.

This report has been developed with the structural engineer's substructure design in hand and also provides justification and confirmation that the measures they have proposed are sufficient for the gas issues at the site to demonstrate the compliant construction before the first occupation of a house.

If any of the procedures outlined in this summary are not completed, this may delay obtaining a Warranty and Council for Mortgage Lenders and a Certificate of Completion.

Table 1.1 Previous Works

Date of E3P SI & Ref	The following previous site investigation reports are known to have been completed at the site: • *E3P Ltd – Hinchley Road, Charlestown – Phase 2 Geoenvironmental Site Assessment – Report Ref: 17-994-R1-1, January 2025;* • *E3P Ltd – Hinchley Road, Charlestown – Ground Gas Addendum – Report Ref: 17-994-R2-1, May 2025.*
Date of Remediation Strategy & Ref	• *E3P Ltd – Hinchley Road, Charlestown – Remediation Strategy – Report Ref: 17-994-R3-1, November 2025;* • *E3P Ltd – Hinchley Road, Charlestown – Geotechnical Performance Specification – Report Ref: 17-994-R4-1, November 2025.*
Date of Enabling Works Validation & Ref	• To be completed in dure course.

1.1. OVERVIEW OF GROUND GAS RISK ASSESSMENT

The final ground gas risk assessment is documented within the E3P Ground Gas Addendum Report dated May 2025 (Report Ref: 17-994-R2-1), which confirmed:

- Elevated CO_2 (>5% v/v) was recorded within WS104, WS105, WS108, WS111 and WS112. The review of a ternary gas plot of the data from these wells indicates that the exceedances are representative of microbial respiration of organic materials in soil and air/CO_2 mixing, characterised by zero methane and low flow, and are not representative of a geogenic or landfill gas source.
- Shallow PEAT deposits were encountered within 21 of the exploratory locations site-wide to a maximum depth of 2.80 m bgl. NF94 states that peat can lead to elevated concentrations of bulk gases but is a low-risk source that cannot generate gas at a significant rate.
- As the peat deposits are currently in a largely saturated state, there is limited potential for ground gas generation. The proposed development will result in a change in the hydrogeology, and this has the potential to change the anaerobic and aerobic environment, which may result in the generation of CH4 and CO2.
- It is understood that organic peat soils will be partially removed from beneath plots across the site and remain in-situ in external areas of the site, thus reducing the gas source for plots. There would be no future risk remaining, and the site should be classified as CS1. In these areas no gas measures required.
- However, peat will remain in situ in the north of the site and so a source of peat and therefore ground gas risk will remain. Peat also remains off site and has a potential risk of migration into the site. Plots in these areas will require mitigation measures to a CS2 level.
- It is understood that regulatory approval has been granted on the basis that some PEAT deposits will be retained on site in the near surface cover system build up and some will remain in situ undisturbed. The PEAT to be retained on site is shown in Drawing 17-994-037.

The E3P Drawing 17-994-042 details the plots that require construction with mitigation measures that are compliant with CS2 Characteristic Situation.

2. GAS MITIGATION DESIGN & VERIFICATION

2.1. OVERVIEW OF RISK CLASSIFICATION

The Ground Gas Risk Assessment suggests that where peat remains, the site should be considered as Characteristic Situation 2 as a precaution which will require specialist mitigation measures to be constructed in accordance with BS8485 (2015)+A1(2019). This related to **plots 29-33, 34-49, 50-58 and 62-74.**

It is assumed that the preceding documents have now been accepted by stakeholders, including the local authority, building control, and warranty providers. This document providing the follow up details is to be approved by all stakeholders stated above, before commencement of any work on-site to construct mitigation measures.

2.2. OVERVIEW OF REQUIREMENTS FOR RESIDENTIAL BUILDING GAS RISK MITIGATION

2.2.1. DESIGN STANDARDS

The overarching design criteria for mitigation of ground gases are defined within British Standards BS8485:2015 +A1:2019 Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Gases for New Buildings.'

The BS8485:2015 +A1:2019 design system references the type of building being constructed (Type A to D), and the gas risk as defined by the site Conceptual Site Model (CSM) (CS1 to CS6) to determine a points-based system for the design of the protection measures.

2.2.2. BRITISH STANDARD BS8485:2015+A1:2019

British Standard BS8485 has determined that the proposed development comprises low-rise residential dwellings that are classified as follows:

- **Type A Building** – Private ownership with no building management controls on alterations to the internal structure, the use of rooms, the ventilation of rooms or the structural fabric of the building. Some small rooms are present. Probably conventional building construction (rather than civil engineering). Examples include private housing and some retail premises.

- **Type B Building** – Private or commercial property with central building management control of any alterations to the building or its uses but limited or no central building management control of the maintenance of the building, including the gas protection measures. Multiple occupancy. Small to medium sized rooms with passive ventilation of rooms and other internal spaces throughout ground floor and basement areas. May be conventional building or civil engineering construction. Examples include managed apartments, multiple occupancy offices, some retail premises and parts of some public buildings (such as schools, hospitals, leisure centres) and parts of hotels.

Based on the ground gas risk assessment and the proposed Type A Building, it is envisaged that a point score of 3.5 will be required for affected properties, as summarised in Table 2.1 and specified in Table 2.2 and Table2.3.

Table 2.1 BS8485:2015+A1:2019 Points Required for Type A and Type B Buildings

CHARACTERISTIC SITUATION	MINIMUM GAS PROTECTION SCORE (POINTS)	
	HIGH SENSITIVITY	
	TYPE A BUILDING	TYPE B BUILDING
1	0	0
2	**3.5**	**3.5**
3	4.5	4
4	6.5 A)	5.5 A)
5	– B)	6
6	– B)	– B)

BS8485 (2015)+A1(2019) 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 for this empirical method to be used to define the gas protection measures.

Table 2.2 Summary of Ground Gas Mitigation Measures – BS8485:2015+A1:2019

GAS PROTECTION SCORES FOR THE STRUCTURAL BARRIER	SCORE[A]
Floor and Substructure Design	
Precast Suspended Segmental Subfloor (Beam and Block)	0
Cast in Situ Ground Bearing Floor Slab (With Only Nominal Mesh Reinforcement)	0.5
Cast in Situ Monolithic Reinforced Ground Bearing Raft or Reinforced Cast in Situ Suspended Floor Slab with Minimal Penetrations	1 or 1.5[B]
Basement Floor and Walls Conforming to BS 8102:2009, Grade 2 WaterproofingC D	2
Basement Floor and Walls Conforming to BS 8102:2009, Grade 3 WaterproofingC D	2.5

Notes
A) The scores are conditional on breaches of floor slabs, etc., being effectively sealed.
B) To achieve a score of 1.5 the raft or suspended slab should be well reinforced to control cracking and have minimal penetrations cast in (see A.2.2.2).
C) The score is conditional on the waterproofing being provided by a suitable structural barrier with the design and detailing of the walls and floor meeting the requirements for Type B protection. The score cannot be assigned for Type A (waterproof membrane) or Type C (drained cavity wall).
D) If a membrane is installed beneath and around the basement to provide Type A waterproofing (BS 8102:2009), it can be assigned a gas protection score in accordance with Table 7, if it meets all the criteria for a gas resistant membrane in that table.
When practical, utilities should enter the building above floor level with any conduit or meter housing being properly vented outside of the building.

PROTECTION ELEMENT SYSTEM		SCORE	COMMENTS
Gas protection scores for ventilation protection measures			
(a) Pressure Relief Pathway – Usually formed of low fines gravel or with a thin geocomposite blanket or strips terminating in a gravel trench external to the building.		0.5	Whenever possible a pressure relief pathway (as a minimum) should be installed in all gas protection measures systems. If the layer has a low permeability and/or is not terminated in a venting trench (or similar), then the score is 0.
(b) Passive Subfloor Dispersal Layer – Media used to provide the dispersal layer are: Clear void; Polystyrene void former blanket; Geocomposite void former blanket; No fines gravel layer with gas drains; and No fines gravel layer.	Very good performance	2.5	The ventilation effectiveness of different media depends on a number of different factors including the transmissivity of the medium, the width of the building, the side ventilation spacing and type and the thickness of the layer. The selected score should be assigned taking into account the recommendations in Annex B of BS 8485 (2015). Passive ventilation should be designed to meet at least "good performance".
	Good performance	1.5	
(c) Active Dispersal Layer – Usually comprising fans with active abstraction (suction) from a subfloor dilution layer with roof level vents. The dilution layer may comprise a clear void or be formed of geocomposite or polystyrene void formers.		1.5 to 2.5	This system relies on continued serviceability of the pumps; therefore alarm and response systems should be in place. There should be robust management systems in place to ensure the continued maintenance of the system, including pumps and vents. Active ventilation should always be designed to meet at least "good performance".
(d) Active Positive Pressurisation – Provided by the creation of a blanket of external fresh air beneath the building floor slab by pumps supplying air to points across the central footprint of the building into a permeable layer, usually formed of a thin geocomposite blanket.		1.5 to 2.5	This system relies on continued operation of the pumps; therefore alarm and response systems should be in place. The score assigned should be based on the efficient "coverage" of the building footprint and the redundancy of the system. Active ventilation should always be designed to meet at least "good performance".
(e) Ventilated Car Park – Floor slab of occupied part of the building under consideration is underlain by a basement or undercroft car park.		4	Assumes that the car park is vented to deal with car exhaust fumes, designed to Buildings Regulations 2000, Approved Document F [9].

PROTECTION ELEMENT SYSTEM	SCORE	COMMENTS	SCORE	COMMENTS
Gas Protection Score for the Gas Resistant Membrane				
Gas resistant membrane meeting all of the following criteria: Sufficiently impervious to the gases with a methane gas transmission rate < 40 ml/day/m^2/atm (average) for sheet and joints (tested in accordance with BS ISO 151051 manometric method); Sufficiently durable to remain serviceable for the anticipated life of the building and duration of gas emissions; Sufficiently strong to withstand in service stresses (e.g. settlement if placed below a floor slab); Sufficiently strong to withstand the installation process and following trades until covered (e.g. penetration from steel fibres in fibre reinforced concrete, penetration of reinforcement ties, tearing due to working above it, dropping tools); Capable, after installation, of providing a complete barrier to the entry of the relevant gas; and Verified in accordance with CIRIA C735.	2	The performance of membranes is heavily dependent on the quality and design of the installation, resistance to damage after installation and integrity of joints. If a membrane is installed that does not meet all the criteria opposite, then the score is zero.		

A) Membrane with a methane gas transmission rate < 40.0 ml/day/m2/atm (average) for sheets and joints (tested in accordance with BS ISO 151051:2007 manometric method) is regarded as sufficiently impervious.
B) For example, reinforced LDPE (virgin polymer) membranes having a minimum mass per unit area of 370 g/m^2 and not significantly less than 0.4 mm thickness between the reinforcement scrim (tested in accordance with Procedure D (2 mm diameter tip) of BS EN ISO 98631:2016) installed above floor slabs are considered sufficiently strong to meet the performance criteria (see also C.3). Thicker and more robust membranes or an additional membrane protection layer should be installed directly beneath cast in situ floor slabs.

2.2.3. GAS MITIGATION COMPLIANCE WITH BS8485:2015 +A1:2019

The Contaminated Land Risk Assessment and developed Conceptual Site Model identified a theoretical risk from hazardous ground gas intrusion associated with viable sources as defined within the developed site CSM.

The risk associated with a gas intrusion pathway will be mitigated by constructing dwellings at **plots 29-33, 34-49, 50-58 and 62-74,** to comply with Characteristic Situation 2 (CS2), which requires a minimum of 3.5 points as defined within BS8485:2015 +A1:2019.

CIRIA 735 provides guidance with respect to the preparation and implementation of verification plan measures that will ensure that the potential for vapour ingress into a dwelling is mitigated in full.

The risk posed by a variety of potentially hazardous ground gases associated with intrusion into the proposed dwellings will be mitigated by a multi-layered pathway intervention strategy that will incorporate the following key attributes to achieve the minimum points requirement as stipulated by BS8485:2015 +A1:2019

CS2 – Plots with Sub-floor Void

- Construction of all with a passively ventilated sub-floor void compliant with 'good performance criteria'. Verification of the sub-floor void and passive ventilation system will be completed in accordance with the validation and checking requirements set out in this report. **1.5 Points.**

- Selection, design and installation of a specialist membrane that will mitigate the migration of hazardous gases into the new dwellings. All membranes will be fully inspected and validated in accordance with industry best practices. **2.0 Points.**

2.2.4. PASSIVE SUB-FLOOR VENTILATION DESIGN

The proposed ventilation of the subfloor layer is required to achieve a minimum' good performance' following BS8485, clause 7.2.3 and Annex B – **1.5 points.**

Real-world applications and limitations in the ability to install close-centred telescopic and air brick ventilation, particularly to the front elevation of a dwelling, necessitate the need to over-design and install ventilation at all available opportunities.

The structural engineer who designed the sub-floor ventilation system with corresponding cranked external venting bricks, internal wall venting pipes, periscopic ventilation and internal cross ventilation for the house sub-structure have provided supporting calculations to demonstrate that, as a minimum, the requirements of BS8485:2015 (+A1 2019) achieve 'good performance' are exceeded. These are included in Appendix IV.

2.2.5. VENTILATION REQUIREMENTS

BS8485:2015 +A1:2019, Section 7.2.3 covers the design of ventilation measures, which includes passive ventilation layers.

Ventilation systems (where pumps or power supply is required) are not appropriate for Type A (private residential buildings).

Table 6 within BS8485 states that for passive subfloor dispersal layers, a score of **2.5 points** applies to ensure 'very good performance', whilst 1.5 points is applied to 'good performance'.

The proposed ventilation of the subfloor layer is required to achieve a minimum' good performance' following BS8485, clause 7.2.3 and Annex B – **1.5 points**.

It was noted on the structural engineer designs that ventilation should be provided on at least two opposite external walls. It should also be provided to whichever gives the greater opening area: 1500m^2 per metre run of external wall or 500mm^2 per m^2 of floor area.

2.2.6. MEMBRANE SELECTION AND PERFORMANCE REQUIREMENTS

All membranes to be considered must be subject to testing in accordance with ISO 15105-2:2003.

Guidance on specifying the properties of a gas membrane is provided in Clause 7.2.4 and Table 7 of BS8485:2015 +A1:2019 gas-resistant membranes should be:

- Sufficiently impervious, both in the sheet material and in the sealing of sheets and sealing around sheet penetrations, to prevent any significant passage of methane and/or carbon dioxide through the membrane;
- Capable after installation of providing a complete barrier to the entry of the relevant gas;
- Sufficiently durable to remain serviceable for the anticipated life of the building and duration of gas emissions;
- Sufficiently strong to withstand in-service stresses (e.g. due to ground settlement if placed below a floor slab);
- Sufficiently strong to withstand the installation process and following construction activities until covered (e.g. penetration from steel fibres in fibre-reinforced concrete, penetration of reinforcement ties, tearing due to working above it, and dropping tools);
- Chemically resistant to degradation by other contaminants that might be present and;
- Verified in accordance with CIRIA C735.

BS8485:2015+A1:2019 places significant emphasis on Gas Transition Rates (GTR) requirements to ensure that a membrane is sufficiently impervious to impede the identified ground gas risk migration. The reliance on GTR must be considered within the context of the site-specific situation and the combined physical barriers that will ultimately inhibit gas migration.

BS8485:2015+A1:2019 Clause 7.2.4 states that *"a methane gas transmission rate of <40.0ml/day/m/atm (average) for sheet and joints (tested in accordance with manometric method BS ISO 15105-1:2007) is usually considered sufficient for a membrane"*.

The maximum Gas Transmission Rate (GTR) that is appropriate depends on the reliance placed on the membrane to impede gas ingress into a dwelling.

BS8485 suggests a maximum value of 40ml/m2 /day/atm. This applies where the membrane can be used in any Characteristic Situation, and it is feasible that the membrane will be the only protection against gas ingress.

In this situation, E3P confirms that the maximum GTR as defined within BS8485 2015 (+A1 2019) is a requirement of the overarching mitigation design specification for any foundation types where there is no ventilated sub-floor void with a good performance.

It is important to note that several additional key factors must be considered when selecting a membrane to ensure it is suitable for use within the design situation (Gas Resistance & Robustness). The potential for damage or degradation to a membrane during construction is of particular concern.

The selected membrane must be able to withstand/demonstrate sufficient performance as detailed below.

- Tensile Strength
- Puncture resistance;
- Elongation potential;
- Impact risk mitigation;
- Puncture and tear resistance.

The selected gas membrane will comprise a proprietary gas membrane consisting of 2000 gauge (400µm), virgin polymer Low-Density Polyethylene (LDPE).

Statements provided by a membrane supplier to demonstrate durability will be supported by written confirmation from a supplier with respect to Quality Assurance to demonstrate soundness.

All membranes to be utilised in a must have minimum mechanical properties as described in Table 2.3 below.

Table 2.3 Gas Membrane Performance – Physical Property Minimum Requirements

PROPERTY	TEST	UNITS	REQUIREMENT
Overall thickness	EN 1849-2	mm	0.40
Tensile Strength	EN 12311	N/mm^2	15
Tensile Elongation	EN12311	%	400
Joint Strength	EN 12317-2	N	298
Resistance to impact	EN12691	mm	200
Durability chemical resistance	EN1847	-	Pass

A manufacturer guarantee of suitability, and compliance will accompany all membranes selected for use within the design situation.

All membranes will be approved by E3P prior to their use in the construction and the verification reports will include confirmation of the product utilised including the manufacturer details, specification sheets and data sheets to demonstrate compliance with the above.

Products that currently meet this standard and may be utilised at the site include (but is not limited to):

- Visqueen Gas Barrier
- Juta GP1 Gas Membrane
- Cordek Puraflex VOC Membrane (Methane, Carbon Dioxide, Radon And VOC).

Miller Homes will be utilising a Visqueen Gas Barrier as the membrane for all plots that require the specification mitigation measures, the membrane specification is included in Appendix V.

2.2.7. BLOCK AND BEAM FOUNDATION – MITIGATION REQUIREMENTS

It is recommended that the specialist designer ensure that the block and beam jointing (structural performance requirement) utilises a specialist seal to impede any gas migration and subsequent ingress.

Within BS8485 a generic risk-based assessment matrix is included that allows the designer to consider the potential for deterioration in the slab to present a subsequent pathway for gas ingress. For ease of reference, Table A.2 is included below.

Table A.2 provides a risk rating summary for ground gas ingress.

Table A.2 — *Risk rating summary*

Substructure/ground floor type	Risk ratings				
	Gaps between member elements	Wall to floor crack	Structural cracking	Micro cracking	Overall risk rating
Precast suspended segmental subfloors without and/or with bonded reinforced structural concrete topping (e.g. beam and block)	Moderate to high	Low	Low	Low to moderate	Very high
Cast in-situ ground bearing floor slab with mesh reinforcement for crack control constructed off a sound sub base (e.g. traditional ground bearing floor slab)	Low	High	Moderate	Moderate to high	High
Cast in situ monolithic reinforced concrete ground bearing raft or suspended/ semi-suspended cast in situ reinforced concrete slab with minimal penetrations	Low	Low	Low	Low to moderate	Medium
Cast in situ reinforced concrete basement constructed to provide Grade 2 or Grade 3 (BS 8102:2009) waterproofing	Low	Low	Low	Low	Low

The proposed use of a block and beam substructure with minimal penetrations (all fully sealed) has a predominant classification as very high risk. However, a cast in-situ reinforced concrete topping will be utilised above the block and beam.

The construction of dwellings using this foundation and floor slab design as a gas mitigation measure is considered suitable to provide a protection score of 1.5.

2.3. MEMBRANE INSTALLATION REQUIREMENTS

Due to the meagre permeation rates that will be required to minimise the risk associated with gas intrusion, it is essential that the membrane is installed correctly and is not damaged afterwards or during construction.

CIRIA C748 defines the dominant mode of fluid transport through poorly installed membranes via holes present due to poor seals and welds, material defects and damage during construction. This mode of transport is significantly greater than permeation through intact membranes.

Installation by suitable, trained and qualified persons and subsequent validation by an independent specialist is vitally important in ensuring the long-term integrity of the membrane and, thus, removal of the theoretical exposure pathway associated with gas migration.

2.3.1. CONTRACTORS PRE-COMMENCEMENT REQUIREMENTS

Prior to the commencement of any installation works, the following will be provided to E3P as a supervising engineer/consultant for review.

- Relevant qualifications of all operatives (minimum NVQ Level 2 – Gas protection installation).
- Detailed installation plan inclusive of method Statement, CQA Procedures and qualifications.
- Provision of the final choice of the membrane system to be utilised.

Section 3.3 of CIRIA C735 states that it is essential that an appropriately experienced and qualified workforce is employed on-site to install ground protection systems. An appropriate, experienced and skilled workforce is recommended with an installer carrying an NVQ level 2 diploma in gas membrane installation or accreditation for plastic welding.

2.4. SITE-SPECIFIC DESIGN REQUIREMENTS

E3P has been provided with the Miller Homes substructure design details which is included in Appendix IV. The plots that require the specification mitigation measures are shown on Drawing 17-997-042, included in Appendix III.

2.5. RADON

The site is situated in an area where 1% and 3% of homes are above the Radon Action Level, therefore radon protection measures are not required for the proposed dwellings.

3. DESIGN INSTALLATION DETAILS

The sub-structure designs are included within the Miller Homes Foundation Details (attached to this specification in Appendix IV).

Miller Homes will construct dwellings with the required foundation solution; however the mitigation measures will be built above the requisite foundation solution, this is from footing up and can be replicated on all foundations to include all mitigation measures in accordance with this design for **plots 29-33, 34-49, 50-58 and 62-74.**

Figure 3.1 Typical External Wall Detail

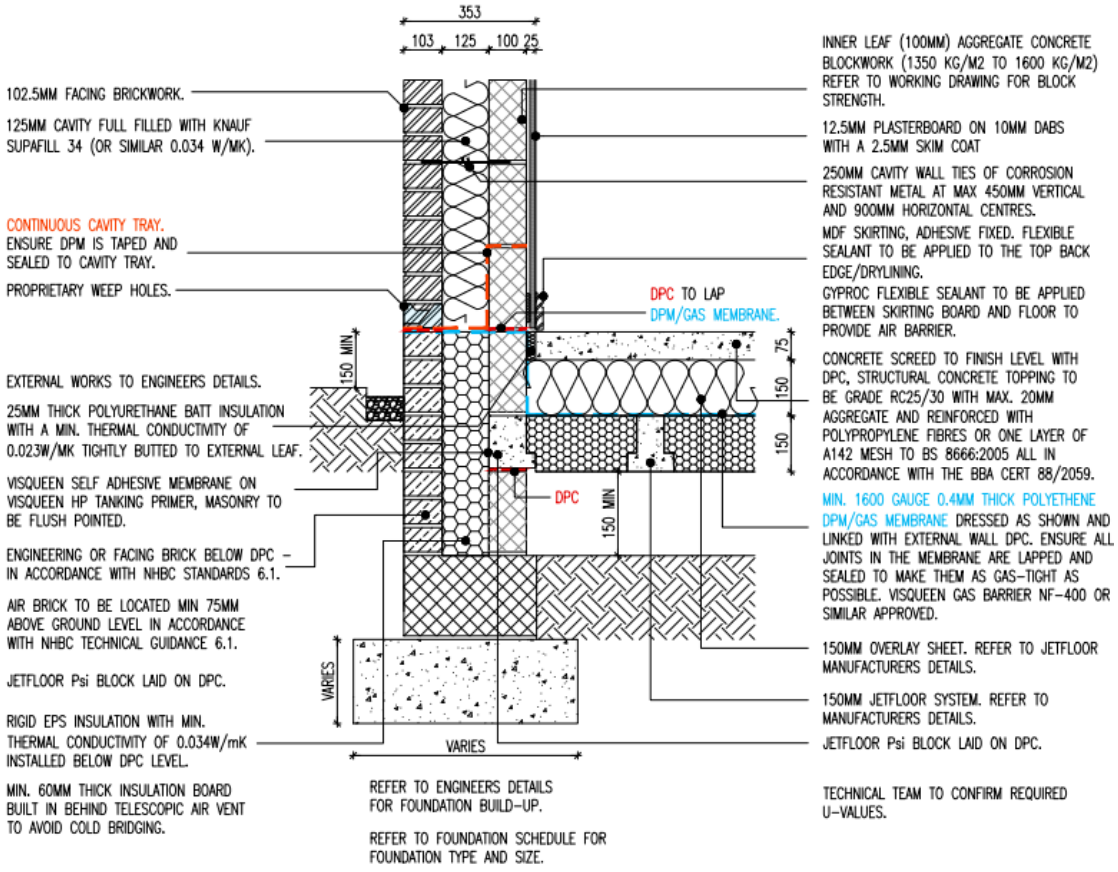


Figure 3.1 confirms the typical detail of external walls.

Figure 3.2 Typical External Wall Through Telescopic Vents

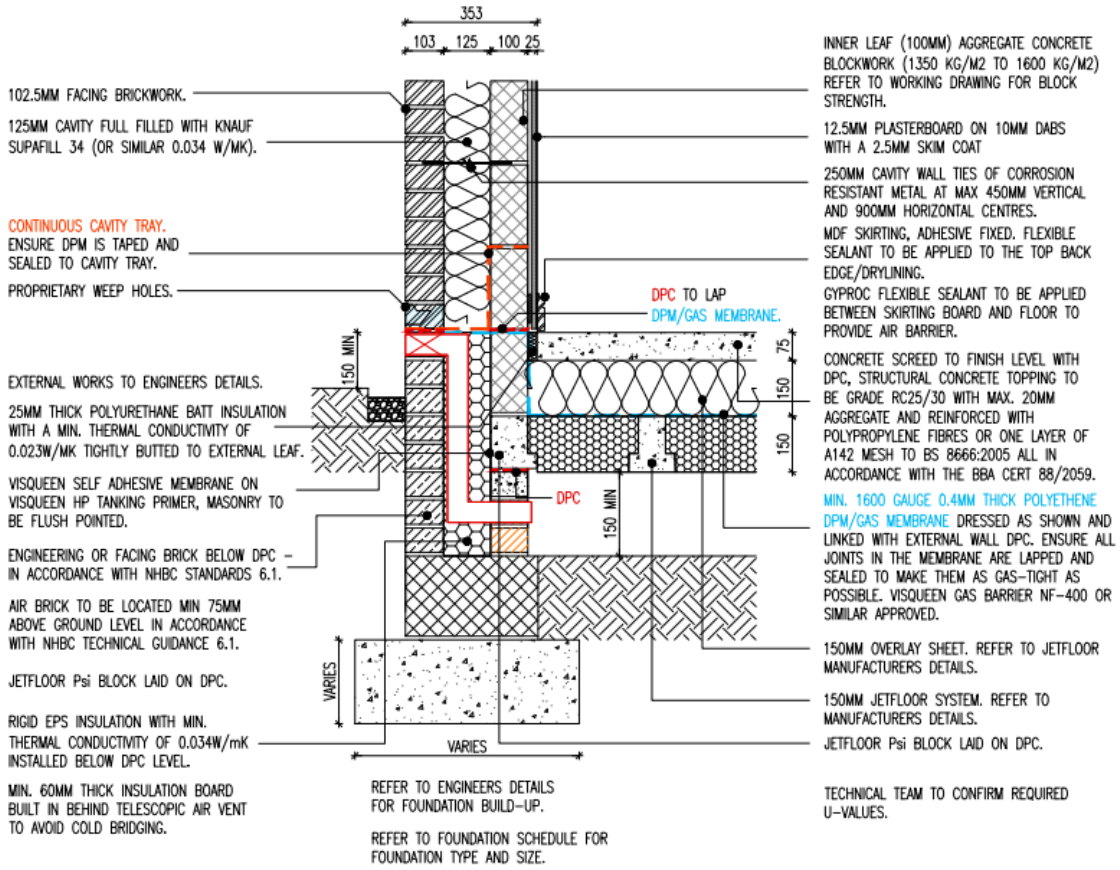


Figure 3.2 confirms the detail of external walls where telescopic vents are placed.

Figure 3.3 Typical External Wall with Level Threshold

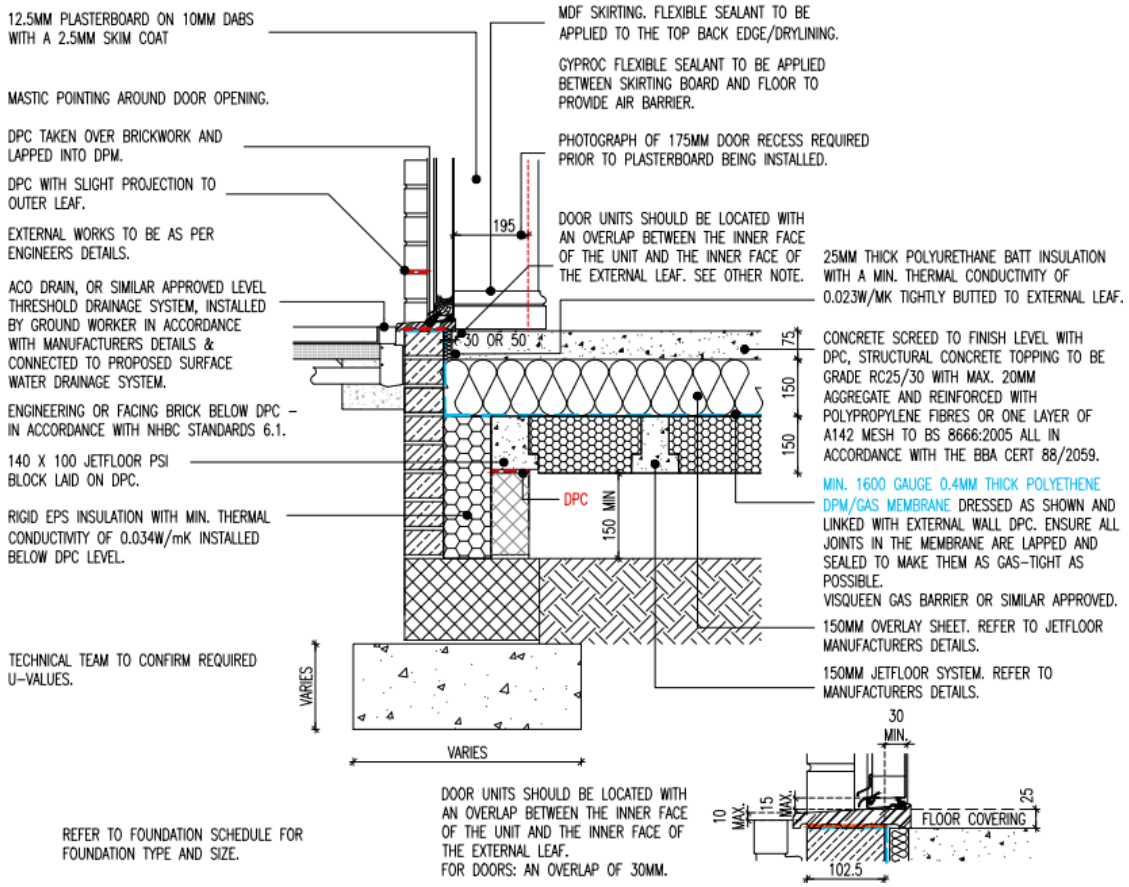


Figure 3.3 confirms the detail of a Typical External Wall with Level Threshold.

Figure 3.4 Typical Internal Wall Detail

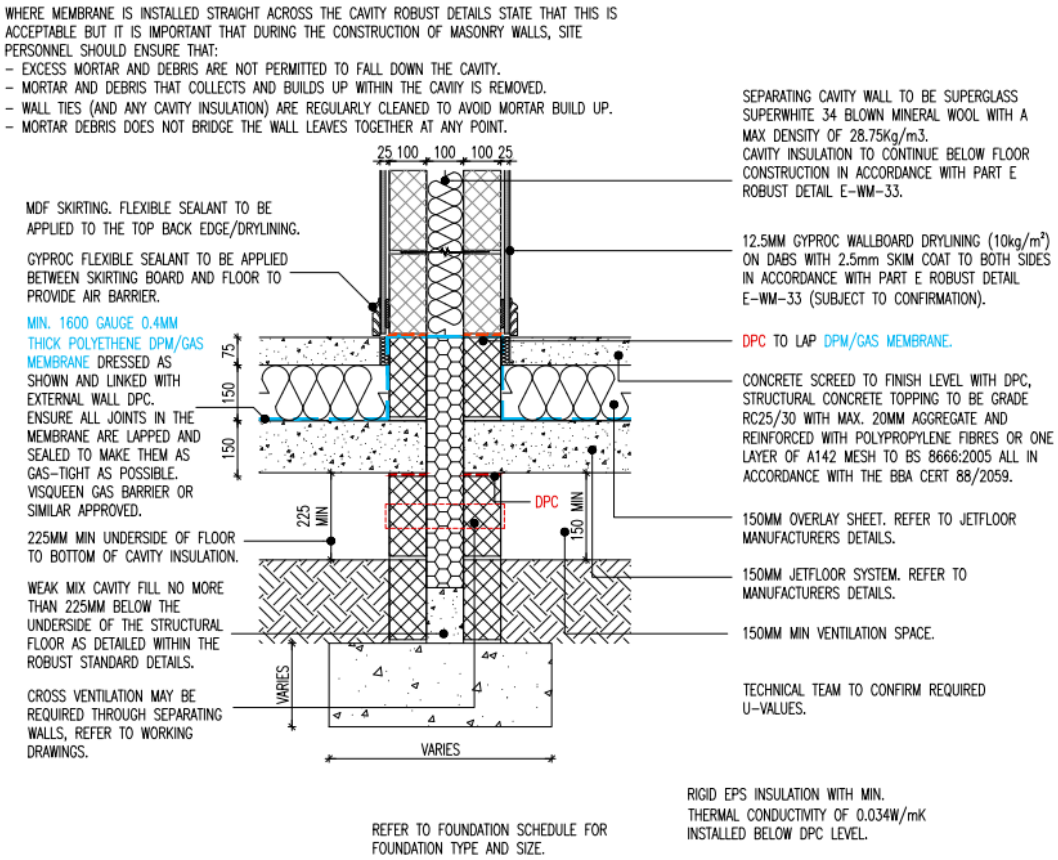


Figure 3.4 confirms the detail of a Typical Internal Wall.

The engineering details are included in APPENDIX IIIAppendix IV.

4. INSTALLATION REQUIREMENTS – VALIDATION REQUIREMENTS

4.1.1. PERSONS RESPONSIBLE FOR VERIFICATION

CIRIA C735 (Section 3.2.2) states that the person validating the membrane must be independent of the installation contractor or material supplier. It is recognised that under certain circumstances, others may assist the independent third-party verifier, but in such a case, their work must be subject to independent third-party audit.

4.1.2. VERIFICATION ACTIVITY PLAN

Table 4.1 Verification Activity Plan

VERIFICATION ACTIVITY	FREQUENCY
Inspection of the sub-floor void dimensions	Every plot where mitigation is required
Inspection of telescopic ventilation and air-brick system	All plots where membrane is required.
Inspection of membrane construction and installation.	All plots where membrane is required.

4.1.3. VENTILATED SUB-FLOOR VOID

Photographic evidence will be collected for the relevant plots to demonstrate that, as a minimum a 150mm clear void is present beneath the suspended floor slab with interconnecting ventilation to the periphery constructed in accordance with the structural engineers' design.

Inspection of sub-floor voids will be completed on each and every plot. Inspections will be completed to demonstrate a high degree of general compliance.

4.1.4. MEMBRANE STORAGE AND PREPARATION

The gas membrane should be stored horizontally, undercover in its original packaging.

Gas membrane is to be installed on a smooth continuous surface e.g. grouted beam and block floor, a compacted blinding layer e.g. 50mm thick sand blinding, or smooth concrete blinding.

The substrate should be free from irregularities such as voids or protrusions.

When installing the membrane in demanding site conditions, use specialist measures to enhance construction and, specifically, the jointing of membranes.

4.1.5. INSTALLATION GENERAL PRINCIPLES

The approved installation contractor will provide all necessary information pertaining to the installation process, as detailed in the earlier sections of this verification strategy.

- The gas membrane will be loosely laid on the substrate with the correct side up to avoid direct sunlight.

- The membrane will be clean and dry at the time of joining.
- It should be overlapped by at least 150mm, bonded with the appropriate jointing tape and sealed to the manufacturer's specification.
- Alternatively, lap joints can be heat welded to achieve an effective seal.
- The overlap in the barrier is typically 100mm, and when hand welding, a 35mm weld is normally achieved.
- When hand welding, a roller must be used.
- Airtight seals should be formed around all service entry points.
- Pre-formed 'Top Hat Units' are recommended for sealing service entry pipes.
- The base of the top hat and the upstand should be bonded using specialist jointing tape and sealed.
- Forming an effective barrier to gases may give rise to complex three-dimensional detailing where it is recommended that pre-formed units are used, e.g. corners. Alternatively, specialist detailing strips can be used to seal difficult junctions.
- If the barrier is punctured or perforated, a patch of the same material should be lapped at least 150mm beyond the limits of the puncture and bonded jointing tape and sealed. Alternatively, a patch can be formed using a detailing strip and lapped at least 150mm beyond the extent of the puncture.
- Long periods of exposure to ultraviolet light will reduce the effectiveness of the membrane.
- The membrane should be covered by a protective layer immediately after installation to prevent damage from following trades, ultraviolet light, etc.
- Care should be taken to ensure that the membrane is not punctured, stretched or displaced when applying a screed or final floor covering.
- A minimum thickness of 50mm screed is recommended.
- When reinforced concrete is to be laid over the barrier, the wire reinforcements and spacers must be prevented from puncturing the barrier.
- Where there is a high risk of potential damage, the barrier should be covered with specialist guard protection, screed or other approved protection material before positioning the reinforcement.

4.1.6. SEALING OF SERVICE DUCTING – CONTRACTORS VERIFICATION RESPONSIBILITY

One of the most common preferential pathways for the migration of hazardous ground gasses into a building is through service ducting that creates a conduit for exaggerated gas ingress.

The contractor and developer will be responsible for sealing all service ducts in their entirety with suitable impervious expanding foam to ensure there is no potential for gas migration.

The adequate sealing of service ducting is an essential part of any gas protection system so E3P will verify the service penetrations for ducting have all been sealed appropriately and include evidence of the same within the individual plot verification report.

4.1.7. GROUND GAS MITIGATION MEASURES VALIDATION

The validation of ground gas mitigations should be completed in line with the items specified in Table 4.2.

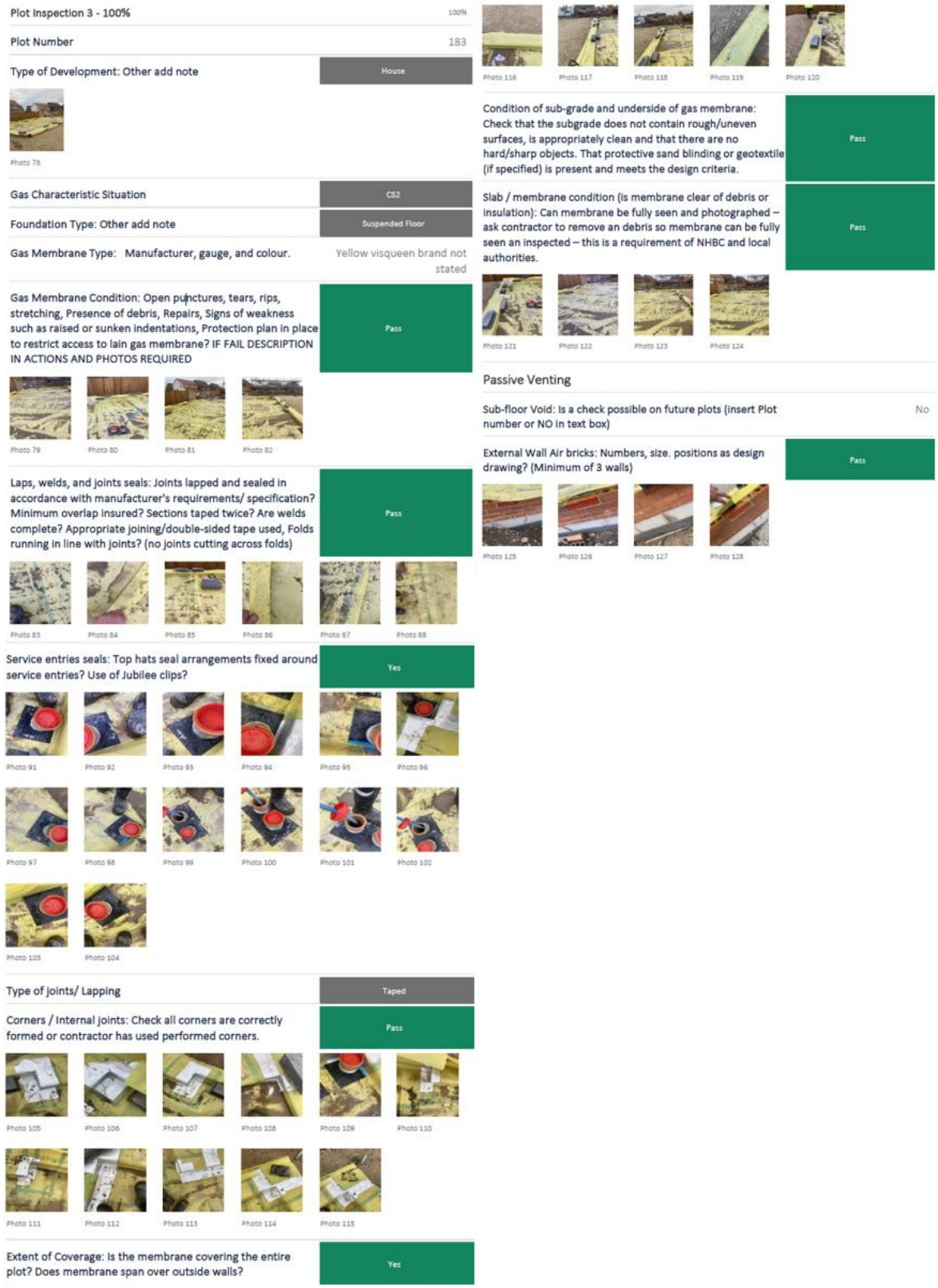
Table 4.2 Ground Gas Mitigation Measures Validation Items

INSPECTION	METHOD
Product Verification	Confirmation that suitable products have been procured for installation to consist of photographs of product types, labels on packaging and delivery tickets.
Passively Ventilated Sub-Floor Cavity	A qualified engineer/consultant will be required to attend the site and validate the compliant construction of the sub-structure with a minimum 150mm sub-floor void. Due to the nature of the construction process and construction using precast suspended segmental floors, it is considered appropriate to check and verify each and every plot constructed with the minimum 150mm sub-floor void.
Wall Cavity Inspection	Confirmation that the gas membrane spans the external wall cavity above the periscopic vents.
General Condition	The membrane is to be inspected to ensure there are no tears, punctures or rips.
Structural reinforcement	Here, structural reinforcement is used over a membrane, which must either be supported by a physical barrier or inspected after placement over a membrane to ensure no damage.
Jointing	The engineer is to check the overlaps between membranes are correctly sealed with sufficient overlaps. The membrane is to be jointed and sealed in accordance with the pre-agreed CQA plan and design requirements.
Service Entry Points	Verification of the presence of pre-formed top hats sealed to the pipe and membrane as per the construction detail.
Remedial Action	Any damage or requirement for remedial action must be recorded and notified in writing. Once repaired, the verifier will undertake the necessary re-inspections.
Passive Venting Systems	The engineer should verify the presence of vents at 1.50m centres on at least two of the external walls. Verification of the stone venting layer and presence of pipes to be supplied by photographic records from the site.
CQA / Audit	The verifier must use an ISO approved system to ensure CQA. This will include electronic data capture with time and location stamps to ensure auditability if required.

Plot specific verification certificates will be completed as and when inspections are undertaken, including the confirmation of mitigation measures required, type of membrane utilised and presence of ventilation for each plot. An example of gas membrane verification photographs is provided in Figure 4.1.

It should be noted that these are for illustrative purposes only, as each site will have a site-specific gas membrane specification.

Figure 4.1 Example Gas Membrane Verification



APPENDIX I
LIMITATIONS



GENERAL

1. This report and any associated works (together comprising the "Services") were compiled and carried out by E3P for the client (as present in Section 1) under the E3P "Terms of Business" or with those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed and outlined in the body of the report.

2. Unless explicitly agreed otherwise, in writing, this report has been prepared under E3P Standard Terms and Business as included within our proposal to the Client.

3. Project-specific appointment documents may be agreed upon at our discretion, and a charge may be levied for both the time to review and finalise appointment documents and also for associated changes to the appointment terms. E3P reserves the right to amend the fee should any changes to the appointment terms create an increased risk to E3P.

4. The report needs to be considered in light of the proposal and associated limitations of scope. The report needs to be read in full and isolated sections cannot be used without full reference to other elements of the report and any previous works referenced within the report.

PHASE 1 GEOENVIRONMENTAL AND PRELIMINARY RISK ASSESSMENTS

5. Coverage: This section covers reports with the following titles or combination of titles: Phase 1; Desktop Study; Geoenvironmental Assessment; Development Appraisal; Preliminary Environmental Risk Assessment; Constraints Report; Due Diligence Report; Geotechnical Development Review; Environmental Statement; Environmental Chapter; Baseline Environmental Assessment; Project Scope Summary Report (PSSR), Program Environmental Impact Report (PEIR), Geotechnical Development Risk Register; Agricultural Land Assessment; Mineral Safeguarding Assessment; Desk Top Coal Mining Risk Assessment; Hydrogeological Appraisal; Construction Environmental Management Plan; and Site Water Management Plan.

6. The works undertaken to prepare this report comprised a study of available and easily documented information from a variety of sources (including the Client), together with (where appropriate) a brief walkover inspection of the site and correspondence with relevant authorities and other interested parties. Due to the short timescales associated with these projects responses may not have been received from all parties. E3P cannot be held responsible for any disclosures that are provided post-production of our report and will not automatically update our report.

7. The opinions given in this report have been dictated by the finite data on which they are based and are relevant only for the purpose for which the report was commissioned. The information reviewed should not be considered exhaustive and has been accepted in good faith as providing true and representative data pertaining to site conditions. Should additional information become available which may affect the opinions expressed in this report, E3P reserves the right to review such information and, if warranted, to modify the opinions accordingly.

8. It should be noted that any risks identified in this report are perceived risks based on the information reviewed. Actual risks can only be assessed following intrusive investigations of the site.

9. Where mention has been made to the identification of Japanese Knotweed and other invasive plant species and asbestos or asbestos-containing materials, this is for indicative purposes only and does not constitute or replace full and proper surveys completed by suitably qualified and experienced specialists in these fields.

10. E3P does not warrant work/data undertaken/provided by others.

INTRUSIVE INVESTIGATION REPORTS

11. Coverage: The following report titles (or combination) may cover this category of work: Geoenvironmental Site Investigation; Geotechnical Assessment; GIR (Ground Investigation Reports); Preliminary Environmental and Geotechnical Risk Assessment; Preliminary Summary; Coal Mining Risk Assessment, Ground Gas Addendum; and, Geotechnical Risk Register.

12. The investigation has been undertaken to provide information concerning either:

    I. The type and degree of contamination present at the site in order to allow a generic quantitative risk assessment to be undertaken; or

    II. Information on the soil properties present at the site to allow for geotechnical development constraints to be considered.

13. The scope of the investigation was selected on the basis of the specific development and land use scenario proposed by the Client and may be inappropriate to another form of development or scheme. If the development layout was not known at the time of the investigation the report findings may need revisiting once the development layout is confirmed.

14. Unless otherwise specified in the scope of works, any site drawing(s) provided in this report is (are) not meant to be an accurate base plan but is (are) used to present the general relative locations of features on, and surrounding, the site. Features (intrusive and sample locations etc) annotated on site plans are not drawn to scale but are centred over the approximate location. Such features should not be used for setting out and should be considered indicative only.

15. For contamination purposes, the objectives of the investigation are limited to establishing the risks associated with potential contamination sources with the potential to cause harm to human health, building materials, the environment (including adjacent land), or controlled waters.

16. For geotechnical investigations, the purpose is to broadly consider potential development constraints associated with the physical property of the soils underlying the site within the context of the proposed future or continued use of the site, as stated within the report.

17. The amount of exploratory work, soil property testing and chemical testing undertaken has necessarily been restricted by various factors which may include accessibility, the presence of services; existing buildings; current site usage or short timescales. The exploratory holes completed assess only a small percentage of the area in relation to the overall size of the site, and as such can only provide a general indication of conditions.

18. The number of sampling points and the methods of sampling and testing do not preclude the possible existence of contamination where concentrations may be significantly higher than those actually encountered or ground conditions that vary from those identified. In addition, there may be exceptional ground conditions elsewhere on the site which have not been disclosed by this investigation and which have therefore not been taken into account in this report.

19. The inspection, testing and monitoring records relate specifically to the investigation points and the timeframe that the works were undertaken. They will also be limited by the techniques employed. As part of this assessment, E3P has used reasonable skill and care to extrapolate conditions between these points based on assumptions to develop our interpretation and conclusions.

20. The assumption made in forming our conclusions is that the ground and groundwater conditions (both chemically and physically) are the same as have been encountered during the works undertaken at the specific points of investigation and at the time of the investigation.

21. Conditions can change between investigation points both spatially and over time and these interpretations should therefore be considered indicative. The assessment of extreme weather events and their impact on ground conditions is not within the scope of E3P's work.

22. The risk assessment and opinions provided are based on currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values. Specific assumptions associated with the risk assessment process have been outlined within the body or associated appendix of the report.

23. Additional investigations may be required in order to satisfy relevant planning conditions or to resolve any engineering and environmental issues.

24. Where soil contamination concentrations recorded as part of this investigation are used for commentary on the potential waste classification of soils for disposal purposes, these should be classed as indicative only. Due consideration should be given to the variability of contaminant concentrations taken from targeted samples versus bulk excavated soils and the potential variability of contaminant concentrations between sampling locations. Where major waste disposal operations are considered, targeted waste classification investigations should be designed and the waste classification and any subsequent disposal option agreed upon with licenced subcontractors and/or the relevant regulators.

25. The results of the asbestos testing are factually reported and interpretation is given as to how this relates to the previous use of the site, the types of ground encountered and site conceptualisation. This does not however constitute a formal asbestos assessment. These results should be treated cautiously and should not be relied upon to provide detailed and representative information on the delineation, type and extent of bulk ACMs and/or trace loose asbestos fibres within the soil matrix at the site.

26. If costs have been included in relation to additional Site works, and/or site remediation works these must be considered as indicative only and must be confirmed by a qualified quantity surveyor.

EUROCODE 7: GEOTECHNICAL DESIGN

27. On 1st April 2010, BS EN 1997-1:2004 (Eurocode 7: Geotechnical Design – Part 1) became the mandatory baseline standard for geotechnical ground investigations.

28. In terms of geotechnical design for foundations, slopes, retaining walls and earthworks, EC7 sets guidance on design procedures including specific guidance on the numbers and spacings of boreholes for geotechnical design, there are limits to methods of ground investigation and the quality of data obtained and there are also prescriptive methods of assessing soil strengths and methods of design. Unless otherwise explicitly stated, the work has not been undertaken in accordance with EC7. A standard geotechnical interpretative report will not meet the requirements of the Geotechnical Design Report (GDR) under Eurocode 7. The GDR can only be prepared following confirmation of all structural loads and serviceability requirements. The report is likely to represent a Ground Investigation Report (GIR) under the Eurocode 7 guidance.

DETAILED QUANTITATIVE RISK ASSESSMENTS AND REMEDIATION AND ENABLING WORK STRATEGY REPORTS

29. These reports build upon previous report versions and associated notes. The scope of the investigation, further testing and monitoring and associated risk assessments were selected based on the specific development and land use scenario proposed by the Client and may not be appropriate to another form of development or scheme layout. The risk assessment and opinions provided are based on currently available approaches in the generation of Site Specific Assessment Criteria relating to contamination concentrations and are not considered to represent a risk in a specific land use scenario to a specific receptor. No liability can be accepted for the retrospective effects of any future changes or amendments to these values, associated models or associated guidance.

30. The outputs of the Detailed Quantitative Risk Assessments are based upon the manipulation of standard risk assessment models. These are our interpretation of the risk assessment criteria.

31. Before adoption on-site, assessment criteria will need to be discussed and agreed upon with the Regulatory Authorities prior to adoption on site. The regulatory discussion and engagement process may result in an alternative interpretation being determined and agreed. The process and timescales associated with the Regulatoy Authority engagement are not within the control of E3P. All costs and programmes presented as a result of this process should be validated by a quantity surveyor and should be presumed to be indicative.

32. E3P does not accept liability for any subcontract work that has not been completed in strict accordance with an approved E3P Remediation and Enabling Works Strategy.

GEOTECHNICAL DESIGN REPORT (GDR)

33. The GDR can only be prepared following confirmation of all structural loads and serviceability requirements. All the relevant information needs to be provided to allow for a GDR to be produced.

MONITORING (INCLUDING REMEDIATION MONITORING REPORTS AND BUILD PHASE MITIGATION)

34. These reports are factual and comprise monitoring, normally groundwater and ground gas and data provided by contractors as part of earthworks or remedial works.

35. The data is presented and will be compared with assessment criteria.

APPENDIX II
GLOSSARY



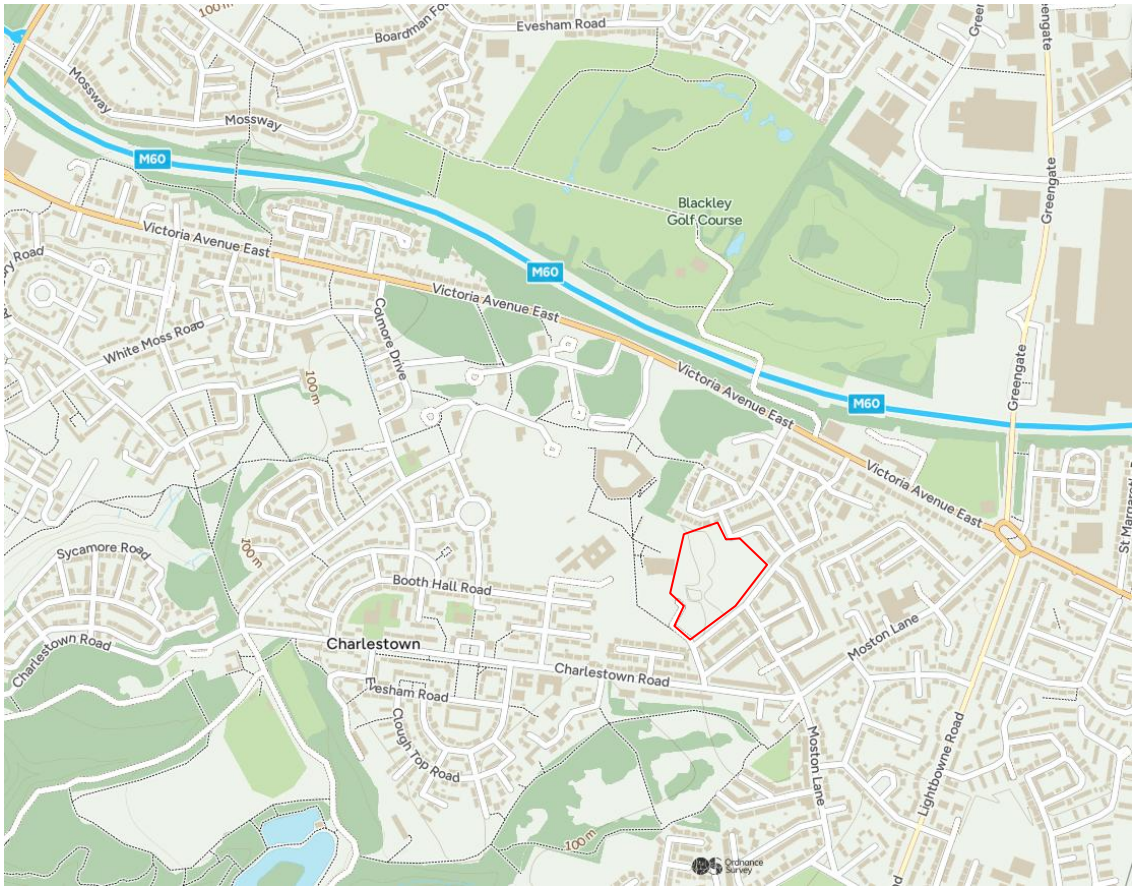
ACM	Asbestos-containing material	MMP	Materials management plan
ADS	Acoustic design statement	ND	Not detected
AST	Above-ground storage tank	NDP	Nuclear density probe
BGS	British Geological Survey	NMP	Noise management plan
BSI	British Standards Institute	NPSE	Noise policy statement for England
BTEX	Benzene, toluene, ethylbenzene, xylenes	NR	Not recorded
CA	Coal Authority	PAH	Polycyclic aromatic hydrocarbon
CBR	California bearing ratio	PCB	Polychlorinated biphenyl
CIEH	Chartered Institute of Environmental Health	PI	Plasticity index
CIRIA	Construction Industry Research Association	PID	Photo ionisation detector
CLEA	Contaminated land exposure assessment	POS	Public open space
CML	Council of Mortgage Lenders	PPE	Personnel protective equipment
CoC	Contaminants of concern	ProPG	Professional practice guidance
CSM	Conceptual site model	QA	Quality assurance
DNAPL	Dense non-aqueous phase liquid (chlorinated solvents, PCB)	SGV	Soil guideline value
DWS	Drinking water standard	SPH	Separate-phase hydrocarbon
EA	Environment Agency	SPT	Standard penetration test
EQS	Environmental quality standard	SVOC	Semi-volatile organic compound
FFL	Finished floor level	TPH	Total and speciated petroleum hydrocarbon
GAC	General assessment criteria	TPH CWG	Total Petroleum Hydrocarbon (Criteria Working Group)
GL	Ground level	UKWIR	United Kingdom Water Infrastructure Risk
GSV	Gas screening value	UST	Underground storage tank
HCV	Health criteria value	VCC	Vibro-concrete column
ICSM	Initial conceptual site model	VOC	Volatile organic compound
LEL	Lower explosive limit	VRSC	Vibro-replacement stone columns
LMRL	Lower method reporting limit	VSC	Vibro-stone columns
LNAPL	Light non-aqueous phase liquid (petrol, diesel, kerosene)	WHO	World Health Organisation
MCV	Moisture condition value	WRAP	Waste and Resources Action Programme

MIBK	Methyl isobutyl ketone	WTE	Water table elevation
m	Metres	ppm	Parts per million
km	Kilometres	mg/m^3	Milligram per metre cubed
% v/v	Percent volume in air	m bgl	Metres below ground level
mb	Millibars (atmospheric pressure)	m bcl	Metre below cover level
l/hr	Litres per hour	mAOD	Metres above ordnance datum (sea level)
µg/l	Micrograms per litre (parts per billion)	kN/m^2	Kilonewtons per metre squared
ppb	Parts per billion	µm	Micrometre
mg/kg	Milligrams per kilogram (parts per million)	SSRT	Site Specific Remediation Target
PSD	Particle Size Distribution	DD	Dry Density
CL:AIRE	Contaminated Land: Applications in Real Environments	Mc	Moisture Content
ρ	Bulk Density	GPR	Ground Penetrating Radar
NDP	Nuclear Density Probe	FFL	Finished Floor Level
LEL	Lower Explosive Limit	UKWIR	UK Water Industry Research
CIRIA	Construction Industry Research and Information Association	LOD	Limit of Detection

APPENDIX III
E3P DRAWINGS



DRAWING 17-994-001 – SITE LOCATION PLAN





N

P1	REVA	14.01.2025	TG	MD	MD	
Phase	Issue	Date	Drawn	Checked	PM	

Notes:

Client: Miler Homes LTD

Job No: 17-994

Date: 14.01.2025

Drawing No: 002

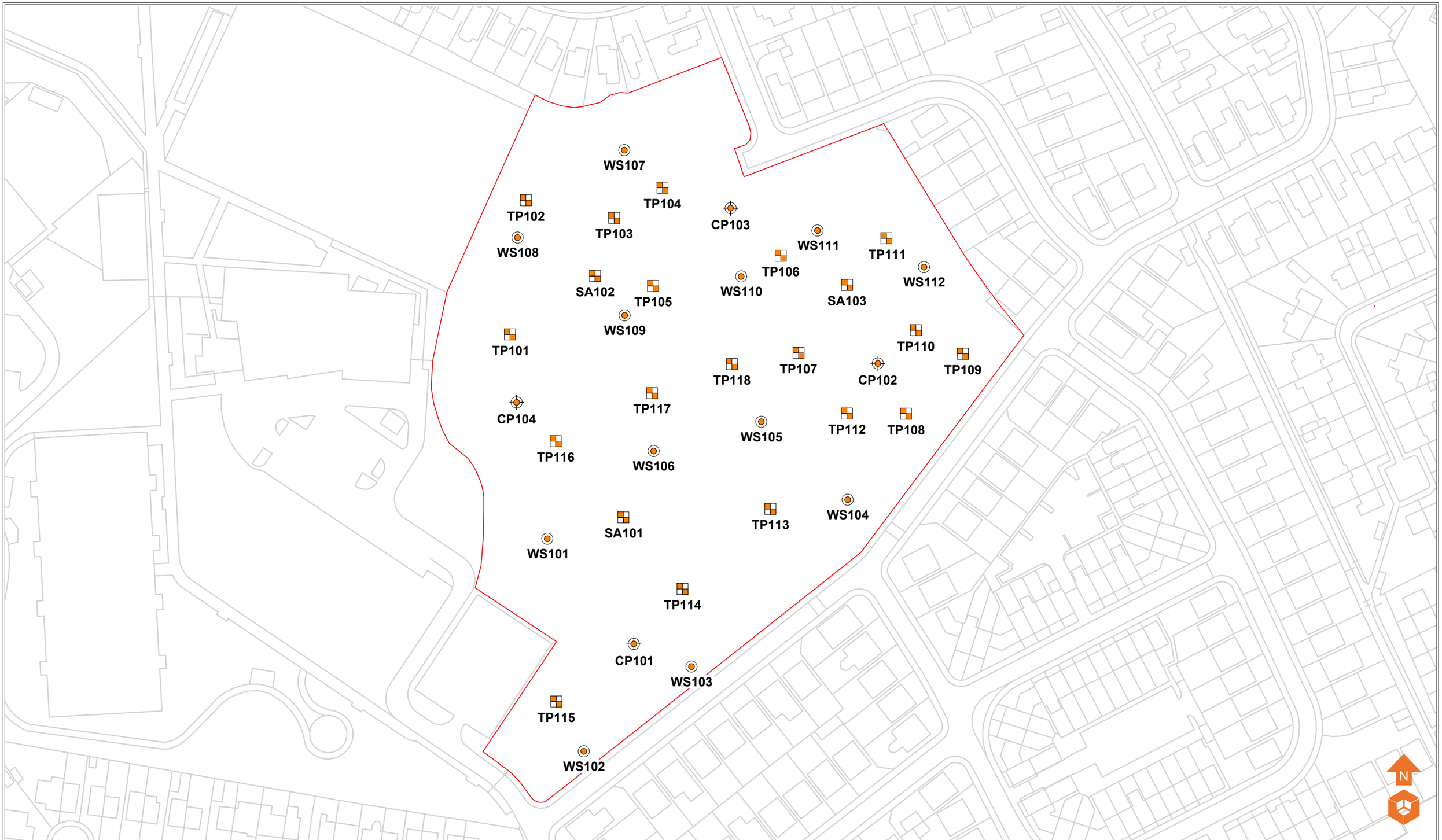
Scale: NTS

Job Title: Hinchley Road, Charlestown

Drawing Title: Proposed Development Plan

Environmental Engineering Partnership Ltd
Taylor Road, Trafford Park
Urmston, Manchester, M41 7JQ
Tel: 0161 707 9612
E-mail: info@e3p.co.uk
Website: www.e3p.co.uk

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Location Symbols

- Approximate Window Sample Probehole Location - E3P Location October 2024
- Approximate Cable Percussive Borehole Location - E3P Location October 2024
- Approximate Soakaway Test Location - E3P Location October 2024
- Approximate Trial Pit Location - E3P Location October 2024

Notes:

P1	REVA	05.11.2024	TG	LC	LC
Phase	Issue	Date	Drawn	Checked	PM

Client: Miller Homes LTD

Job No: 17-994

Date: 05.11.2024

Drawing No: 006

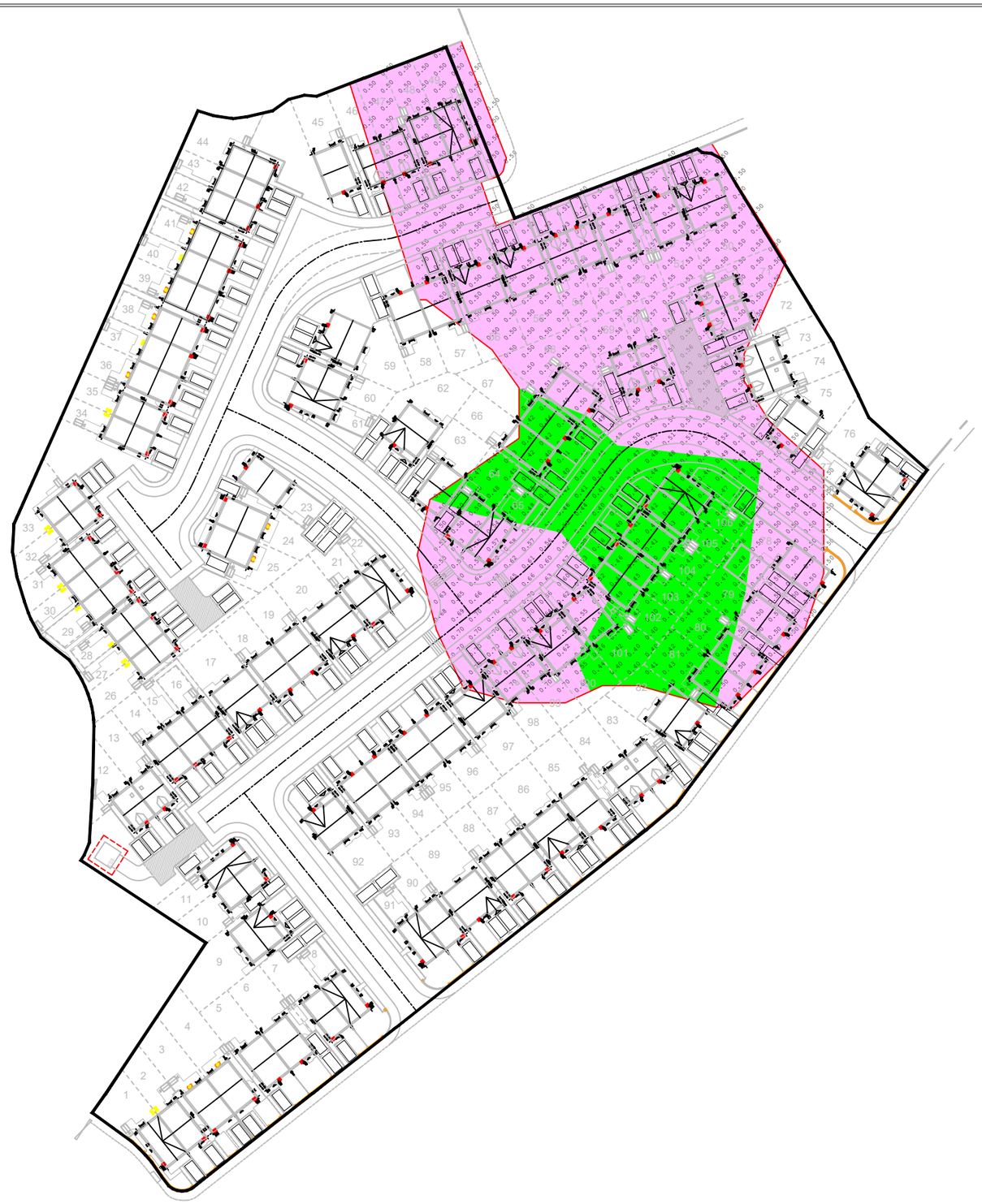
Scale: NTS

Job Title: Hinchley Road, Charlestown

Drawing Title: Exploratory Hole Location Plan

e3p
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Peat Thickness (m)

- Thickness of Peat 0.00 - 0.24m
- Thickness of Peat 0.25 - 0.49m
- Thickness of Peat 0.50 - 0.74m
- Thickness of Peat >0.75m

Notes:

Approximate Volume of Peat - 4275m³
Approximate Area of Peat - 8314m²

Phase	Issue	Date	Drawn	Checked	PM
P1	REVB	14.10.2025	CB	MD	MD
P1	REVA	13.10.2025	CB	MD	MD

Client: Miller Homes

Job No: 17-994

Date: 14.10.2025

Drawing No: 034

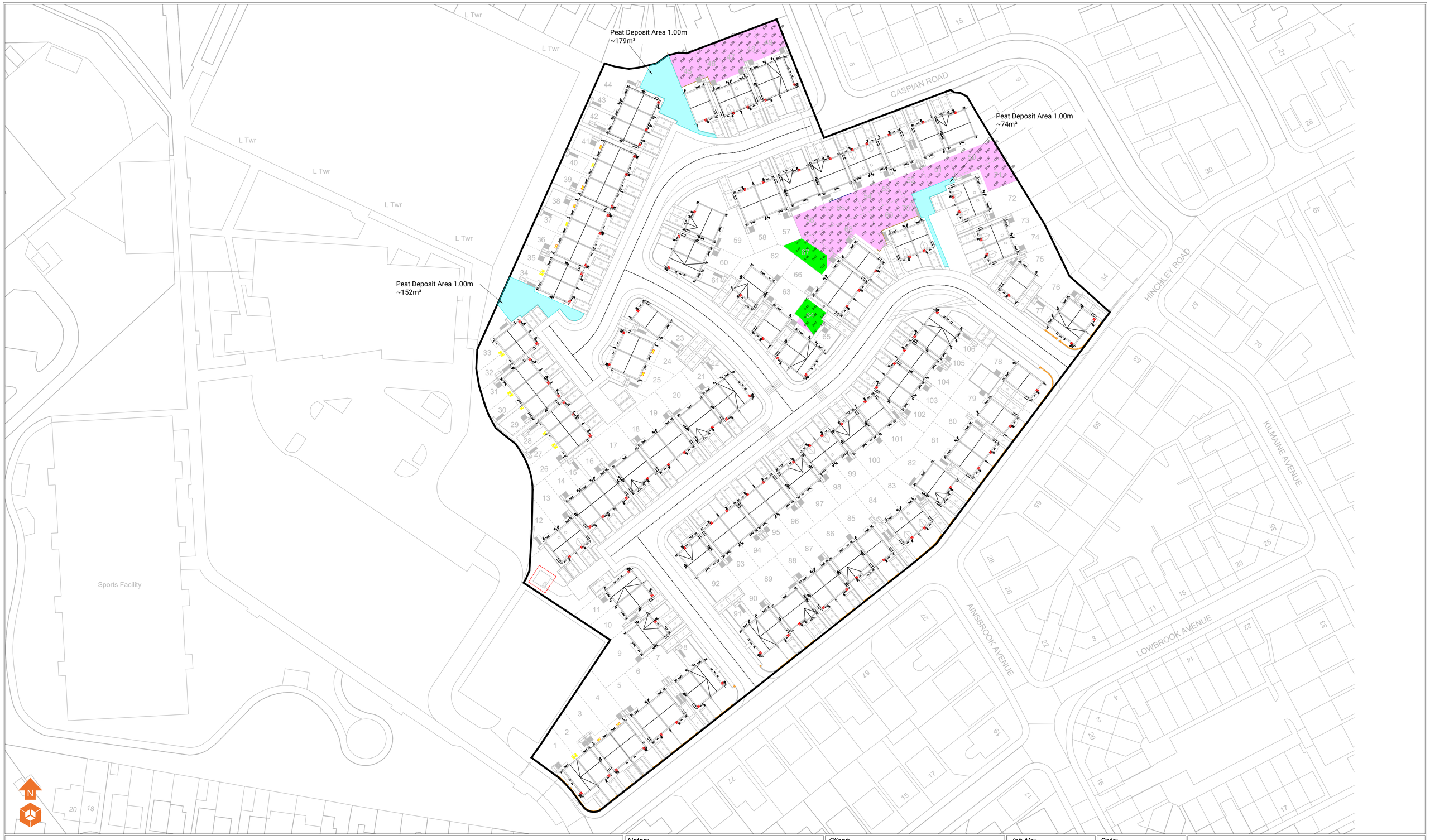
Scale: NTS @ A3

Job Title: Hinchley Road

Drawing Title: Thickess of Peat Plan

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Urmston, Manchester, M41 7JQ
Tel: 0161 707 9612
E-mail: info@e3p.co.uk
Website: www.e3p.co.uk

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Peat Thickness (m)

- Thickness of Peat 0.00 - 0.24m
- Thickness of Peat 0.25 - 0.49m
- Thickness of Peat 0.50 - 0.74m
- Thickness of Peat >0.75m

Notes:

Approximate Volume of Peat to Remain: 646m³
Approximate Area of Peat to Remain: 1237m²

Client: Miller Homes

Job No: 17-994

Date: 09.12.2025

Drawing No: 037

Scale: NTS @ A1

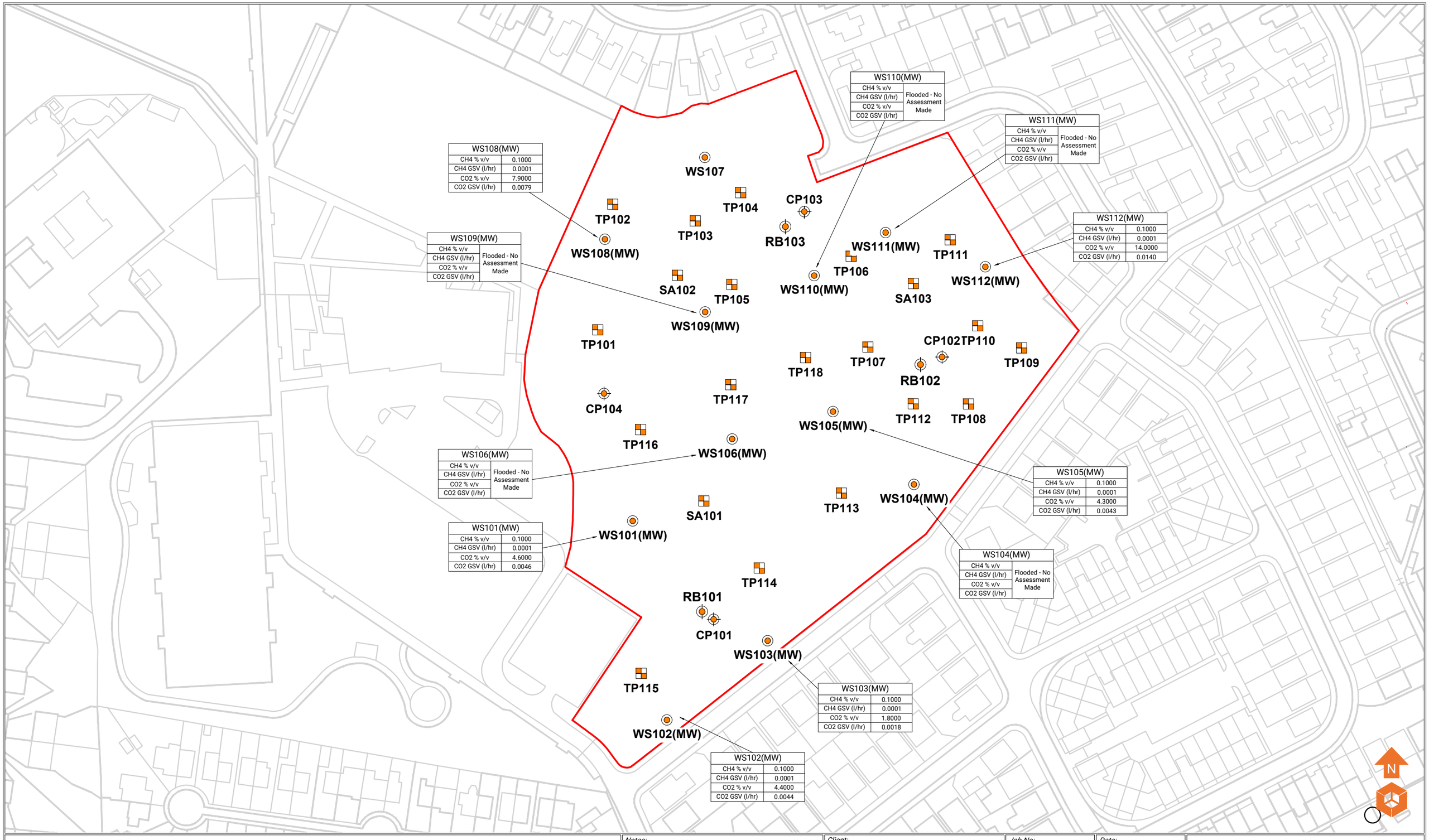
Phase	Issue	Date	Drawn	Checked	PM
P1	REVB	09.12.2025	CB	RJW	RJW
P1	REVA	10.11.2025	CB	MD	RJW

Job Title: Hinchley Road

Drawing Title: Retained Peat Plan

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Location Symbols

- Approximate Window Sample Probehole Location - E3P Location October 2024
- Approximate Cable Percussive Borehole Location - E3P Location October 2024
- Approximate Soakaway Test Location - E3P Location October 2024
- Approximate Trial Pit Location - E3P Location October 2024

Notes:

Client: Miller Homes LTD

Job No: 17-994

Date: 29.07.2026

Drawing No: 038

Scale: NTS

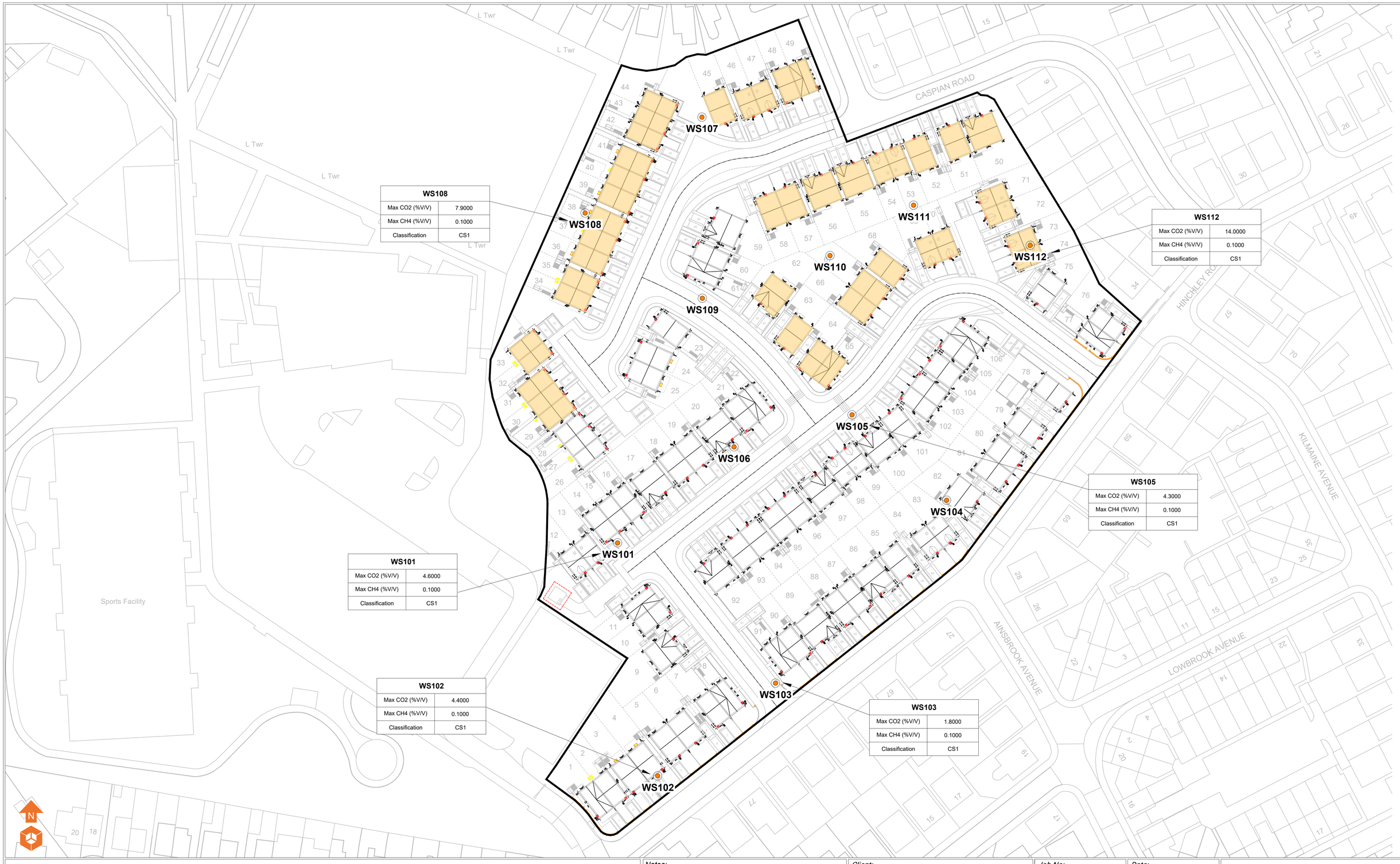
Phase	Issue	Date	Drawn	Checked	PM
P1	REVA	29.07.2026	CB	EF	EF

Job Title: Hinchley Road, Charlestown

Drawing Title: Ground Gas Monitoring Plan

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Taylor Road, Trafford Park
Urmston, Manchester, M41 7JQ
Tel: 0161 707 9612
E-mail: info@e3p.co.uk
Website: www.e3p.co.uk

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WS108	
Max CO2 (%V/V)	7.9000
Max CH4 (%V/V)	0.1000
Classification	CS1

WS112	
Max CO2 (%V/V)	14.0000
Max CH4 (%V/V)	0.1000
Classification	CS1

WS105	
Max CO2 (%V/V)	4.3000
Max CH4 (%V/V)	0.1000
Classification	CS1

WS101	
Max CO2 (%V/V)	4.6000
Max CH4 (%V/V)	0.1000
Classification	CS1

WS102	
Max CO2 (%V/V)	4.4000
Max CH4 (%V/V)	0.1000
Classification	CS1

WS103	
Max CO2 (%V/V)	1.8000
Max CH4 (%V/V)	0.1000
Classification	CS1

Gas Zoning

CS2 Mitigation Measures Required

Notes:

Gas Zoning Driven by areas of retained peat or newly created peat storage. Generally ground gas spot monitoring has classified the site as CS1 and so measures are precautionary.

Client:

Miller Homes

Job No: 17-994

Date: 09.12.2025

Drawing No: 042

Scale: NTS @ A1

P1	REVA	09.12.2025	CB	RJW	RJW
Phase	Issue	Date	Drawn	Checked	PM

Job Title:

Hinchley Road

Drawing Title:

CS2 Zoning Plan

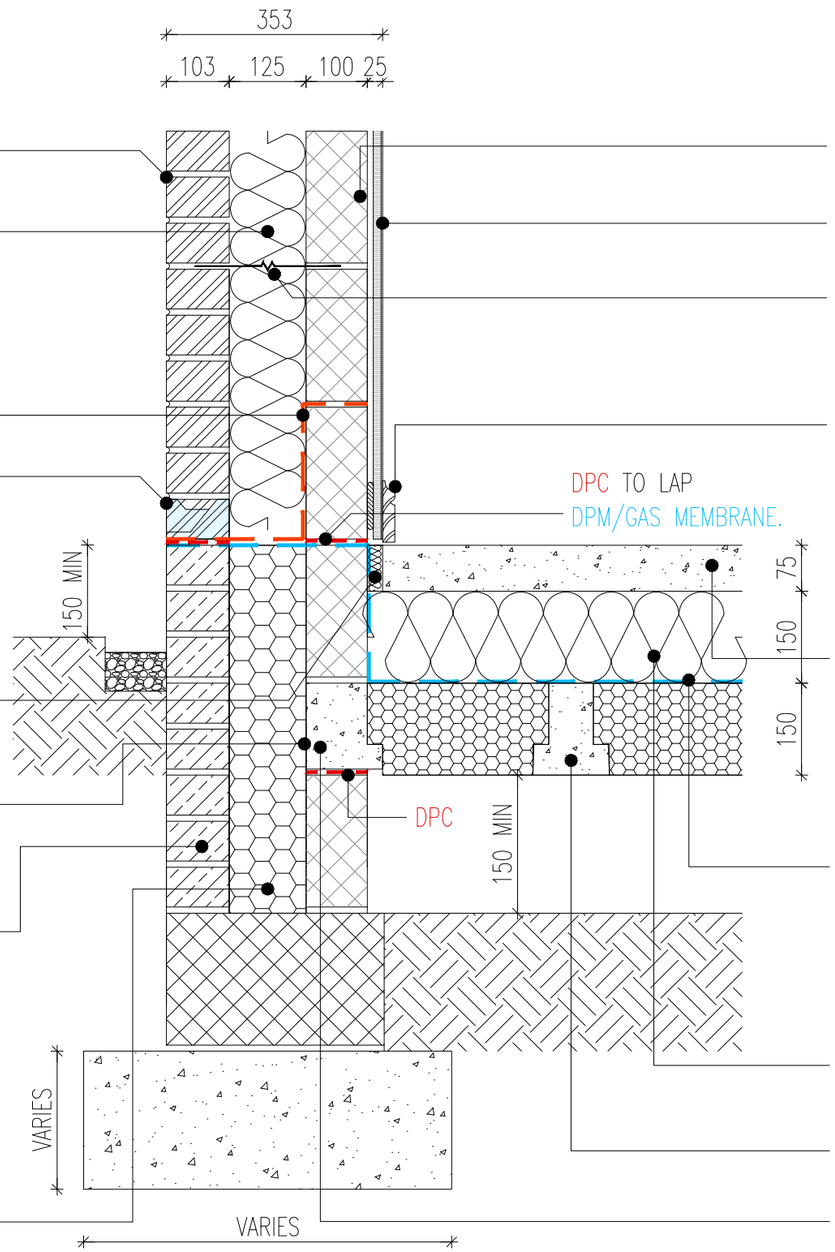
e3p

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APPENDIX IV
STRUCTURAL ENGINEERS DRAWINGS





102.5MM FACING BRICKWORK.

125MM CAVITY FULL FILLED WITH KNAUF SUPAFILL 34 (OR SIMILAR 0.034 W/MK).

CONTINUOUS CAVITY TRAY.
ENSURE DPM IS TAPED AND SEALED TO CAVITY TRAY.

PROPRIETARY WEEP HOLES.

EXTERNAL WORKS TO ENGINEERS DETAILS.

25MM THICK POLYURETHANE BATT INSULATION WITH A MIN. THERMAL CONDUCTIVITY OF 0.023W/MK TIGHTLY BUTTED TO EXTERNAL LEAF.

VISQUEEN SELF ADHESIVE MEMBRANE ON VISQUEEN HP TANKING PRIMER, MASONRY TO BE FLUSH POINTED.

ENGINEERING OR FACING BRICK BELOW DPC – IN ACCORDANCE WITH NHBC STANDARDS 6.1.

AIR BRICK TO BE LOCATED MIN 75MM ABOVE GROUND LEVEL IN ACCORDANCE WITH NHBC TECHNICAL GUIDANCE 6.1.

JETFLOOR Psi BLOCK LAID ON DPC.

RIGID EPS INSULATION WITH MIN. THERMAL CONDUCTIVITY OF 0.034W/mK INSTALLED BELOW DPC LEVEL.

MIN. 60MM THICK INSULATION BOARD BUILT IN BEHIND TELESCOPIC AIR VENT TO AVOID COLD BRIDGING.

REFER TO ENGINEERS DETAILS FOR FOUNDATION BUILD-UP.

REFER TO FOUNDATION SCHEDULE FOR FOUNDATION TYPE AND SIZE.

INNER LEAF (100MM) AGGREGATE CONCRETE BLOCKWORK (1350 KG/M2 TO 1600 KG/M2) REFER TO WORKING DRAWING FOR BLOCK STRENGTH.

12.5MM PLASTERBOARD ON 10MM DABS WITH A 2.5MM SKIM COAT

250MM CAVITY WALL TIES OF CORROSION RESISTANT METAL AT MAX 450MM VERTICAL AND 900MM HORIZONTAL CENTRES.

MDF SKIRTING, ADHESIVE FIXED. FLEXIBLE SEALANT TO BE APPLIED TO THE TOP BACK EDGE/DRYLINING.

GYPROC FLEXIBLE SEALANT TO BE APPLIED BETWEEN SKIRTING BOARD AND FLOOR TO PROVIDE AIR BARRIER.

CONCRETE SCREED TO FINISH LEVEL WITH DPC, STRUCTURAL CONCRETE TOPPING TO BE GRADE RC25/30 WITH MAX. 20MM AGGREGATE AND REINFORCED WITH POLYPROPYLENE FIBRES OR ONE LAYER OF A142 MESH TO BS 8666:2005 ALL IN ACCORDANCE WITH THE BBA CERT 88/2059.

MIN. 1600 GAUGE 0.4MM THICK POLYETHENE DPM/GAS MEMBRANE DRESSED AS SHOWN AND LINKED WITH EXTERNAL WALL DPC. ENSURE ALL JOINTS IN THE MEMBRANE ARE LAPPED AND SEALED TO MAKE THEM AS GAS-TIGHT AS POSSIBLE. VISQUEEN GAS BARRIER NF-400 OR SIMILAR APPROVED.

150MM OVERLAY SHEET. REFER TO JETFLOOR MANUFACTURERS DETAILS.

150MM JETFLOOR SYSTEM. REFER TO MANUFACTURERS DETAILS.

JETFLOOR Psi BLOCK LAID ON DPC.

TECHNICAL TEAM TO CONFIRM REQUIRED U-VALUES.

GROUND FLOOR DETAILS GENERIC NOTES:

BLOCK STRENGTHS MAY VARY,
REFER TO WORKING DRAWINGS & STRUCTURAL ENGINEERS CALCULATIONS.

TECHNICAL TEAM TO CONFIRM REQUIRED U-VALUES.

DETAILS APPLICABLE TO EXPOSURE ZONES:
- SHELTERED
- MODERATE
- SEVERE

FOR VERY SEVERE EXPOSURE ZONES REFER TO ALTERNATIVE DETAILS.

SEPARATING WALLS TO ROBUST DETAIL REF. E-WM-33.

1:10 0 100 200 300 500mm

Rev.	Description	Drawn	Date

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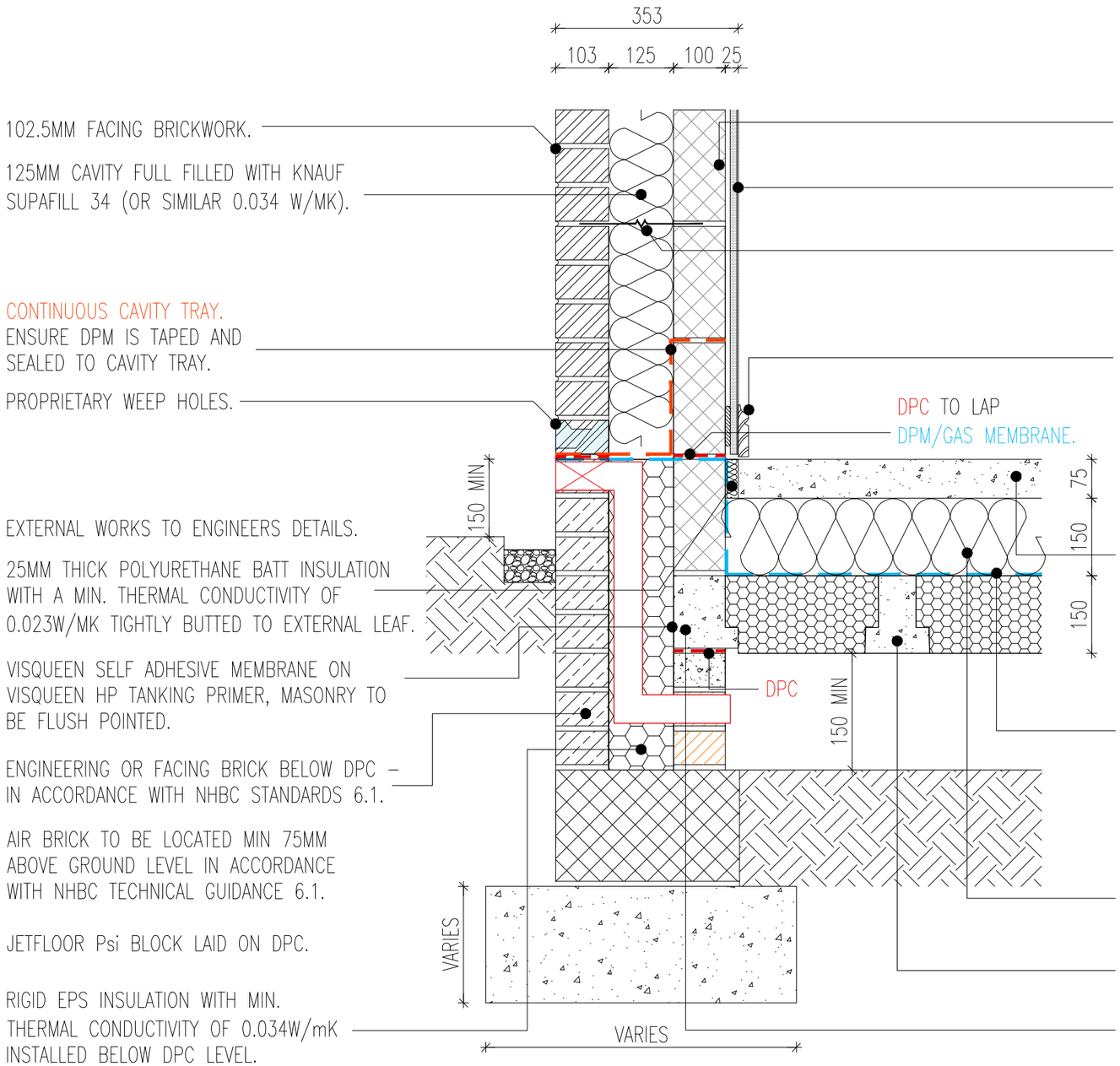
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Project Title
STANDARD DETAILS
NORTH WEST REGION
JETFLOOR SYSTEM

Drawing Title
EXTERNAL WALL
GAS MEMBRANE

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REFER TO ENGINEERS DETAILS FOR FOUNDATION BUILD-UP.

REFER TO FOUNDATION SCHEDULE FOR FOUNDATION TYPE AND SIZE.

GROUND FLOOR DETAILS GENERIC NOTES:

BLOCK STRENGTHS MAY VARY, REFER TO WORKING DRAWINGS & STRUCTURAL ENGINEERS CALCULATIONS.

TECHNICAL TEAM TO CONFIRM REQUIRED U-VALUES.

DETAILS APPLICABLE TO EXPOSURE ZONES:
- SHELTERED
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FOR VERY SEVERE EXPOSURE ZONES REFER TO ALTERNATIVE DETAILS.

SEPARATING WALLS TO ROBUST DETAIL REF. E-WM-33.

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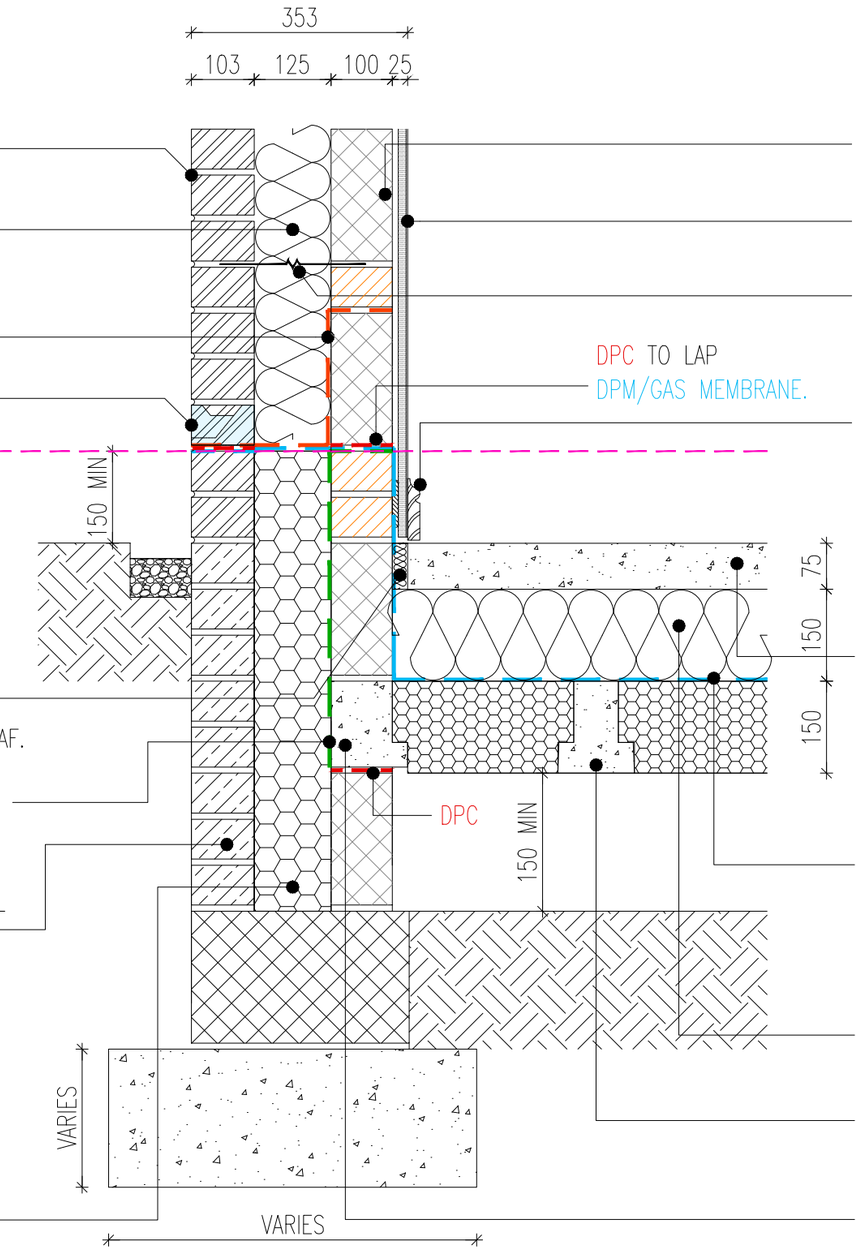
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Project Title
STANDARD DETAILS
NORTH WEST REGION
JETFLOOR SYSTEM

Drawing Title
EXTERNAL WALL THROUGH TELESCOPIC VENT
GAS MEMBRANE

Scale	Drawn By	Checked By	Authorised By
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Job No.	Drawing No.	Revision
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102.5MM FACING BRICKWORK.

125MM CAVITY FULL FILLED WITH KNAUF SUPAFILL 34 (OR SIMILAR 0.034 W/MK).

CONTINUOUS CAVITY TRAY.

PROPRIETARY WEEP HOLES.

GROUNDWORKER RESPONSIBLE FOR MASONRY UP TO THIS POINT.

GROUNDWORKER TO ALLOW FOR RIGID EPS INSULATION TO 150MM ABOVE FFL – MIN. THERMAL CONDUCTIVITY OF 0.034W/MK.

EXTERNAL WORKS TO ENGINEERS DETAILS.

25MM THICK POLYURETHANE BATT INSULATION WITH A MIN. THERMAL CONDUCTIVITY OF 0.023W/MK TIGHTLY BUTTED TO EXTERNAL LEAF.

VISQUEEN SELF ADHESIVE MEMBRANE ON VISQUEEN HP TANKING PRIMER, MASONRY TO BE FLUSH POINTED.

ENGINEERING OR FACING BRICK BELOW DPC – IN ACCORDANCE WITH NHBC STANDARDS 6.1.

AIR BRICK TO BE LOCATED MIN 75MM ABOVE GROUND LEVEL IN ACCORDANCE WITH NHBC TECHNICAL GUIDANCE 6.1.

JETFLOOR Psi BLOCK LAID ON DPC.

RIGID EPS INSULATION WITH MIN. THERMAL CONDUCTIVITY OF 0.034W/mK INSTALLED BELOW DPC LEVEL.

MIN. 60MM THICK INSULATION BOARD BUILT IN BEHIND TELESCOPIC AIR VENT TO AVOID COLD BRIDGING.

DPC TO LAP DPM/GAS MEMBRANE.

INNER LEAF (100MM) AGGREGATE CONCRETE BLOCKWORK (1350 KG/M2 TO 1600 KG/M2) REFER TO WORKING DRAWING FOR BLOCK STRENGTH.

12.5MM PLASTERBOARD ON 10MM DABS WITH A 2.5MM SKIM COAT

250MM CAVITY WALL TIES OF CORROSION RESISTANT METAL AT MAX 450MM VERTICAL AND 900MM HORIZONTAL CENTRES.

MDF SKIRTING, ADHESIVE FIXED. FLEXIBLE SEALANT TO BE APPLIED TO THE TOP BACK EDGE/DRYLINING.

GYPROC FLEXIBLE SEALANT TO BE APPLIED BETWEEN SKIRTING BOARD AND FLOOR TO PROVIDE AIR BARRIER.

CONCRETE SCREED TO FINISH LEVEL WITH DPC, STRUCTURAL CONCRETE TOPPING TO BE GRADE RC25/30 WITH MAX. 20MM AGGREGATE AND REINFORCED WITH POLYPROPYLENE FIBRES OR ONE LAYER OF A142 MESH TO BS 8666:2005 ALL IN ACCORDANCE WITH THE BBA CERT 88/2059.

MIN. 1600 GAUGE 0.4MM THICK POLYETHENE DPM/GAS MEMBRANE DRESSED AS SHOWN AND LINKED WITH EXTERNAL WALL DPC. ENSURE ALL JOINTS IN THE MEMBRANE ARE LAPPED AND SEALED TO MAKE THEM AS GAS–TIGHT AS POSSIBLE.
VISQUEEN GAS BARRIER OR SIMILAR APPROVED.

150MM OVERLAY SHEET. REFER TO JETFLOOR MANUFACTURERS DETAILS.

150MM JETFLOOR SYSTEM. REFER TO MANUFACTURERS DETAILS.

JETFLOOR Psi BLOCK LAID ON DPC.

TECHNICAL TEAM TO CONFIRM REQUIRED U–VALUES.

REFER TO ENGINEERS DETAILS FOR FOUNDATION BUILD–UP.

REFER TO FOUNDATION SCHEDULE FOR FOUNDATION TYPE AND SIZE.

GROUND FLOOR DETAILS GENERIC NOTES:

BLOCK STRENGTHS MAY VARY, REFER TO WORKING DRAWINGS & STRUCTURAL ENGINEERS CALCULATIONS.

TECHNICAL TEAM TO CONFIRM REQUIRED U–VALUES.

DETAILS APPLICABLE TO EXPOSURE ZONES:
- SHELTERED
- MODERATE
- SEVERE

FOR VERY SEVERE EXPOSURE ZONES REFER TO ALTERNATIVE DETAILS.

SEPARATING WALLS TO ROBUST DETAIL REF. E–WM–33.

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Rev.	Description	Drawn	Date

Project Title
STANDARD DETAILS
NORTH WEST REGION
JETFLOOR SYSTEM

Drawing Title
EXTERNAL WALL
RAISED GROUND LEVELS
GAS MEMBRANE

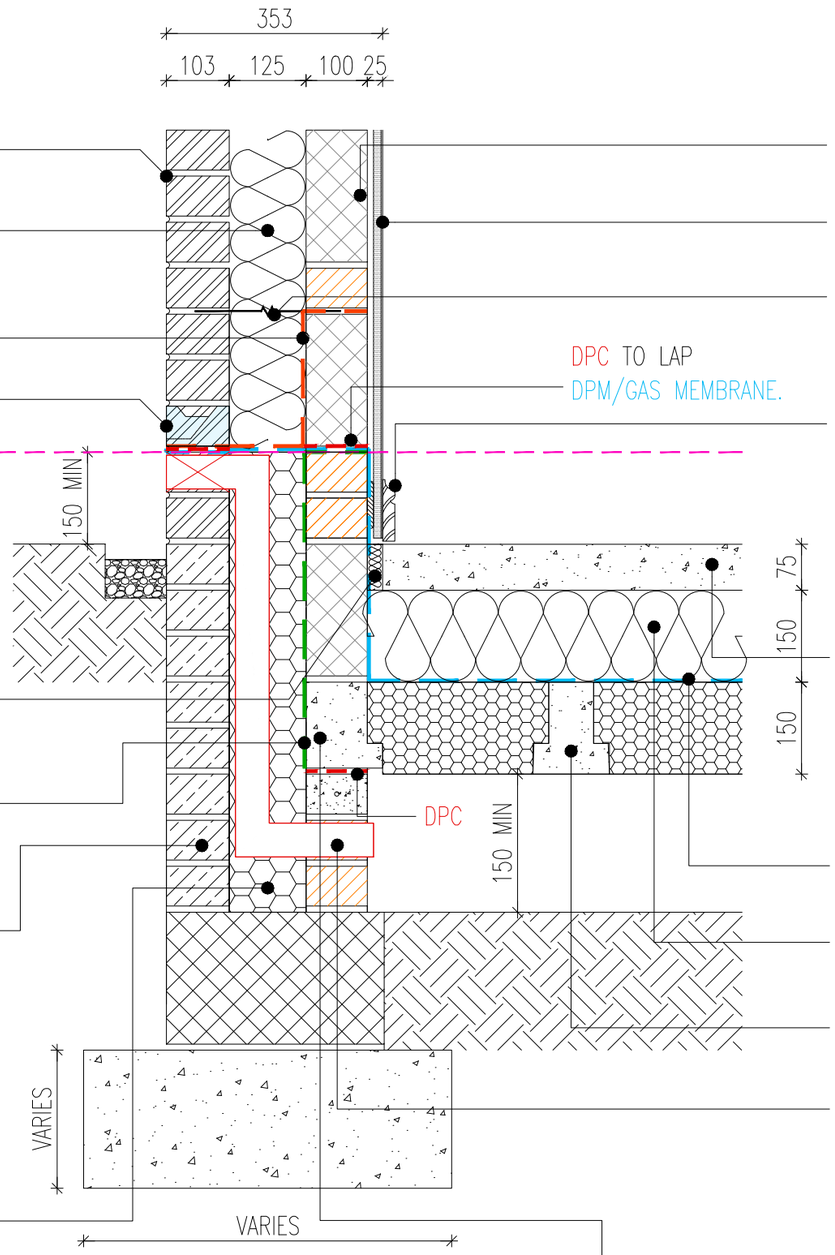
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102.5MM FACING BRICKWORK.

125MM CAVITY FULL FILLED WITH KNAUF SUPAFILL 34 (OR SIMILAR 0.034 W/MK).

CONTINUOUS CAVITY TRAY.
ENSURE DPM IS TAPED AND SEALED TO CAVITY TRAY.

PROPRIETARY WEEP HOLES.

GROUNDWORKER RESPONSIBLE FOR MASONRY UP TO THIS POINT.

GROUNDWORKER TO ALLOW FOR RIGID EPS INSULATION TO 150MM ABOVE FFL – MIN. THERMAL CONDUCTIVITY OF 0.034W/MK.

EXTERNAL WORKS TO ENGINEERS DETAILS.

25MM THICK POLYURETHANE BATT INSULATION WITH A MIN. THERMAL CONDUCTIVITY OF 0.023W/MK TIGHTLY BUTTED TO EXTERNAL LEAF.

VISQUEEN SELF ADHESIVE MEMBRANE ON VISQUEEN HP TANKING PRIMER, MASONRY TO BE FLUSH POINTED.

ENGINEERING OR FACING BRICK BELOW DPC – IN ACCORDANCE WITH NHBC STANDARDS 6.1.

AIR BRICK TO BE LOCATED MIN 75MM ABOVE GROUND LEVEL IN ACCORDANCE WITH NHBC TECHNICAL GUIDANCE 6.1.

JETFLOOR Psi BLOCK LAID ON DPC.

RIGID EPS INSULATION WITH MIN. THERMAL CONDUCTIVITY OF 0.034W/mK INSTALLED BELOW DPC LEVEL.

MIN. 60MM THICK INSULATION BOARD BUILT IN BEHIND TELESCOPIC AIR VENT TO AVOID COLD BRIDGING.

REFER TO ENGINEERS DETAILS FOR FOUNDATION BUILD-UP.

REFER TO FOUNDATION SCHEDULE FOR FOUNDATION TYPE AND SIZE.

INNER LEAF (100MM) AGGREGATE CONCRETE BLOCKWORK (1350 KG/M2 TO 1600 KG/M2) REFER TO WORKING DRAWING FOR BLOCK STRENGTH.

12.5MM PLASTERBOARD ON 10MM DABS WITH A 2.5MM SKIM COAT

250MM CAVITY WALL TIES OF CORROSION RESISTANT METAL AT MAX 450MM VERTICAL AND 900MM HORIZONTAL CENTRES.

MDF SKIRTING, ADHESIVE FIXED. FLEXIBLE SEALANT TO BE APPLIED TO THE TOP BACK EDGE/DRYLINING.

GYPROC FLEXIBLE SEALANT TO BE APPLIED BETWEEN SKIRTING BOARD AND FLOOR TO PROVIDE AIR BARRIER.

CONCRETE SCREED TO FINISH LEVEL WITH DPC, STRUCTURAL CONCRETE TOPPING TO BE GRADE RC25/30 WITH MAX. 20MM AGGREGATE AND REINFORCED WITH POLYPROPYLENE FIBRES OR ONE LAYER OF A142 MESH TO BS 8666:2005 ALL IN ACCORDANCE WITH THE BBA CERT 88/2059.
MIN. 1600 GAUGE 0.4MM THICK POLYETHENE DPM/GAS MEMBRANE DRESSED AS SHOWN AND LINKED WITH EXTERNAL WALL DPC. ENSURE ALL JOINTS IN THE MEMBRANE ARE LAPPED AND SEALED TO MAKE THEM AS GAS-TIGHT AS POSSIBLE OVERLAY SHEET. REFER TO JETFLOOR MANUFACTURERS DETAILS OR SIMILAR APPROVED.

150MM JETFLOOR SYSTEM. REFER TO MANUFACTURERS DETAILS.

PROPRIETARY PERISCOPE FLOOR VENTS TO PROVIDE NOT LESS THAN 1500MM2 VENTILATION PER METER RUN OF EXTERNAL WALL OR 500MM2 PER SQUARE METER OF FLOOR AREA, WHICHEVER GIVES GREATER OPENING AREA AS DESCRIBED IN NHBC STANDARDS 5.2.10.

JETFLOOR Psi BLOCK LAID ON DPC.

TECHNICAL TEAM TO CONFIRM REQUIRED U-VALUES.

GROUND FLOOR DETAILS GENERIC NOTES:

BLOCK STRENGTHS MAY VARY,
REFER TO WORKING DRAWINGS & STRUCTURAL ENGINEERS CALCULATIONS.

TECHNICAL TEAM TO CONFIRM REQUIRED U-VALUES.

DETAILS APPLICABLE TO EXPOSURE ZONES:
- SHELTERED
- MODERATE
- SEVERE

FOR VERY SEVERE EXPOSURE ZONES REFER TO ALTERNATIVE DETAILS.

SEPARATING WALLS TO ROBUST DETAIL REF. E-WM-33.

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Rev.	Description	Drawn	Date

Project Title
STANDARD DETAILS
NORTH WEST REGION
JETFLOOR SYSTEM

Drawing Title
EXTERNAL WALL THROUGH TELESCOPIC VENT
RAISED GROUND LEVELS
GAS MEMBRANE

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12.5MM PLASTERBOARD ON 10MM DABS WITH A 2.5MM SKIM COAT

MASTIC POINTING AROUND DOOR OPENING.

DPC TAKEN OVER BRICKWORK AND LAPPED INTO DPM.

DPC WITH SLIGHT PROJECTION TO OUTER LEAF.

EXTERNAL WORKS TO BE AS PER ENGINEERS DETAILS.

ACO DRAIN, OR SIMILAR APPROVED LEVEL THRESHOLD DRAINAGE SYSTEM, INSTALLED BY GROUND WORKER IN ACCORDANCE WITH MANUFACTURERS DETAILS & CONNECTED TO PROPOSED SURFACE WATER DRAINAGE SYSTEM.

ENGINEERING OR FACING BRICK BELOW DPC – IN ACCORDANCE WITH NHBC STANDARDS 6.1.

140 X 100 JETFLOOR PSI BLOCK LAID ON DPC.

RIGID EPS INSULATION WITH MIN. THERMAL CONDUCTIVITY OF 0.034W/mK INSTALLED BELOW DPC LEVEL.

TECHNICAL TEAM TO CONFIRM REQUIRED U–VALUES.

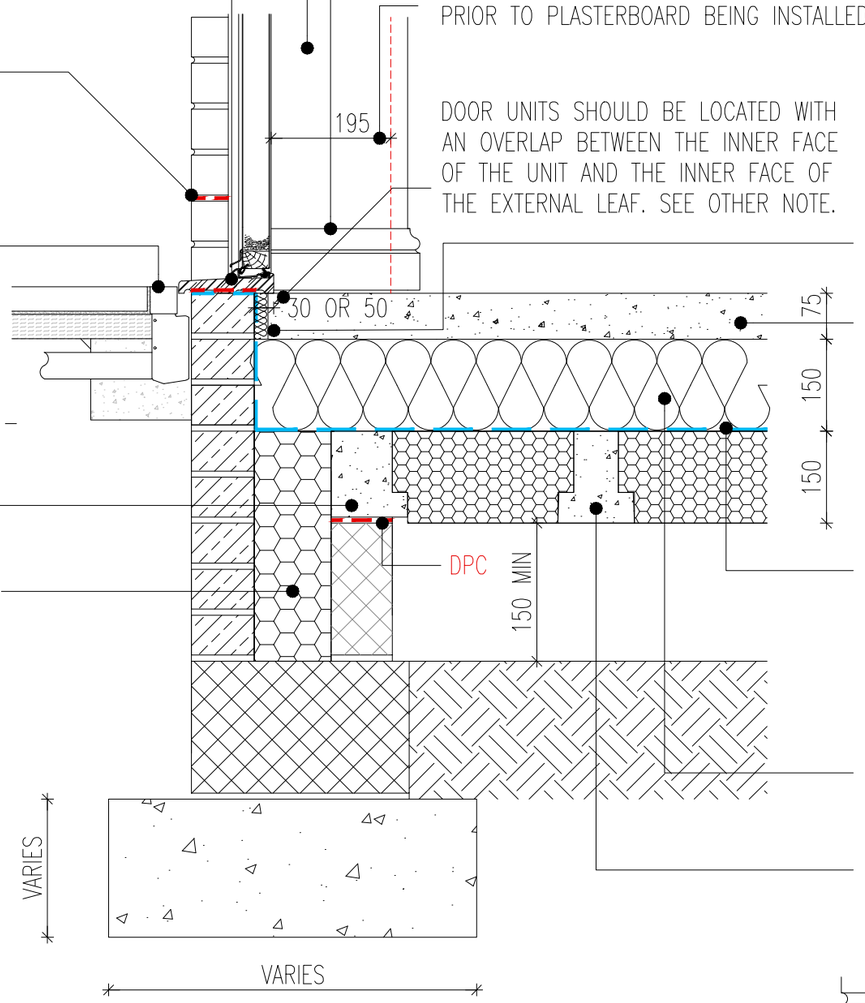
REFER TO FOUNDATION SCHEDULE FOR FOUNDATION TYPE AND SIZE.

MDF SKIRTING. FLEXIBLE SEALANT TO BE APPLIED TO THE TOP BACK EDGE/DRYLINING.

GYPROC FLEXIBLE SEALANT TO BE APPLIED BETWEEN SKIRTING BOARD AND FLOOR TO PROVIDE AIR BARRIER.

PHOTOGRAPH OF 175MM DOOR RECESS REQUIRED PRIOR TO PLASTERBOARD BEING INSTALLED.

DOOR UNITS SHOULD BE LOCATED WITH AN OVERLAP BETWEEN THE INNER FACE OF THE UNIT AND THE INNER FACE OF THE EXTERNAL LEAF. SEE OTHER NOTE.



25MM THICK POLYURETHANE BATT INSULATION WITH A MIN. THERMAL CONDUCTIVITY OF 0.023W/MK TIGHTLY BUTTED TO EXTERNAL LEAF.

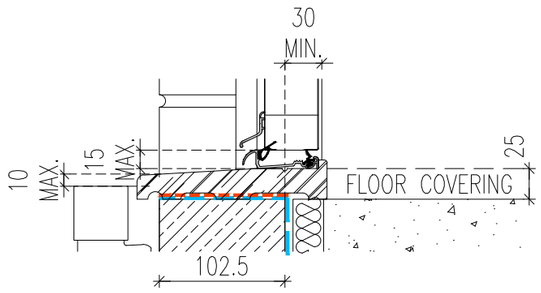
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MIN. 1600 GAUGE 0.4MM THICK POLYETHENE DPM/GAS MEMBRANE DRESSED AS SHOWN AND LINKED WITH EXTERNAL WALL DPC. ENSURE ALL JOINTS IN THE MEMBRANE ARE LAPPED AND SEALED TO MAKE THEM AS GAS–TIGHT AS POSSIBLE.
VISQUEEN GAS BARRIER OR SIMILAR APPROVED.

150MM OVERLAY SHEET. REFER TO JETFLOOR MANUFACTURERS DETAILS.

150MM JETFLOOR SYSTEM. REFER TO MANUFACTURERS DETAILS.

DOOR UNITS SHOULD BE LOCATED WITH AN OVERLAP BETWEEN THE INNER FACE OF THE UNIT AND THE INNER FACE OF THE EXTERNAL LEAF.
FOR DOORS: AN OVERLAP OF 30MM.



GROUND FLOOR DETAILS GENERIC NOTES:

BLOCK STRENGTHS MAY VARY, REFER TO WORKING DRAWINGS & STRUCTURAL ENGINEERS CALCULATIONS.

TECHNICAL TEAM TO CONFIRM REQUIRED U–VALUES.

DETAILS APPLICABLE TO EXPOSURE ZONES:
- SHELTERED
- MODERATE
- SEVERE

FOR VERY SEVERE EXPOSURE ZONES REFER TO ALTERNATIVE DETAILS.

M4(1) – DOOR UNIT TO BE LOCATED WITH A MIN. 30MM OVERLAP BETWEEN THE INNER FACE OF THE UNIT AND THE INNER FACE OF THE EXTERNAL LEAF.
NOTE: 30MM OVERLAP ACCOUNTED FOR WITHIN STANDARD PSI VALUE CALCULATION.

M4(2) & M4(3) – DOOR UNIT TO BE LOCATED WITH A MIN. 50MM OVERLAP BETWEEN THE INNER FACE OF THE UNIT AND THE INNER FACE OF THE EXTERNAL LEAF.

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Project Title
STANDARD DETAILS
NORTH WEST REGION
JETFLOOR SYSTEM

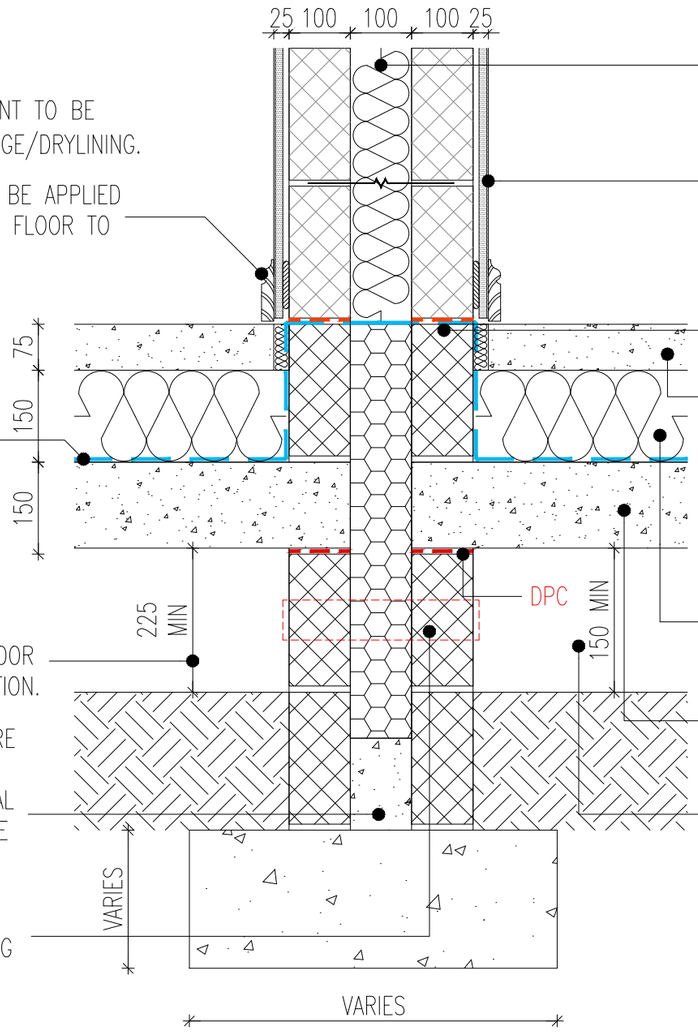
Drawing Title
EXTERNAL WALL
LEVEL THRESHOLD DETAIL
GAS MEMBRANE

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WHERE MEMBRANE IS INSTALLED STRAIGHT ACROSS THE CAVITY ROBUST DETAILS STATE THAT THIS IS ACCEPTABLE BUT IT IS IMPORTANT THAT DURING THE CONSTRUCTION OF MASONRY WALLS, SITE PERSONNEL SHOULD ENSURE THAT:

- EXCESS MORTAR AND DEBRIS ARE NOT PERMITTED TO FALL DOWN THE CAVITY.
- MORTAR AND DEBRIS THAT COLLECTS AND BUILDS UP WITHIN THE CAVIIY IS REMOVED.
- WALL TIES (AND ANY CAVITY INSULATION) ARE REGULARLY CLEANED TO AVOID MORTAR BUILD UP.
- MORTAR DEBRIS DOES NOT BRIDGE THE WALL LEAVES TOGETHER AT ANY POINT.



MDF SKIRTING. FLEXIBLE SEALANT TO BE APPLIED TO THE TOP BACK EDGE/DRYLINING.

GYPROC FLEXIBLE SEALANT TO BE APPLIED BETWEEN SKIRTING BOARD AND FLOOR TO PROVIDE AIR BARRIER.

MIN. 1600 GAUGE 0.4MM THICK POLYETHENE DPM/GAS MEMBRANE DRESSED AS SHOWN AND LINKED WITH EXTERNAL WALL DPC. ENSURE ALL JOINTS IN THE MEMBRANE ARE LAPPED AND SEALED TO MAKE THEM AS GAS-TIGHT AS POSSIBLE. VISQUEEN GAS BARRIER OR SIMILAR APPROVED.

225MM MIN UNDERSIDE OF FLOOR TO BOTTOM OF CAVITY INSULATION.

WEAK MIX CAVITY FILL NO MORE THAN 225MM BELOW THE UNDERSIDE OF THE STRUCTURAL FLOOR AS DETAILED WITHIN THE ROBUST STANDARD DETAILS.

CROSS VENTILATION MAY BE REQUIRED THROUGH SEPARATING WALLS, REFER TO WORKING DRAWINGS.

SEPARATING CAVITY WALL TO BE SUPERGLASS SUPERWHITE 34 BLOWN MINERAL WOOL WITH A MAX DENSITY OF 28.75Kg/m3.
CAVITY INSULATION TO CONTINUE BELOW FLOOR CONSTRUCTION IN ACCORDANCE WITH PART E ROBUST DETAIL E-WM-33.

12.5MM GYPROC WALLBOARD DRYLINING (10kg/m²) ON DABS WITH 2.5mm SKIM COAT TO BOTH SIDES IN ACCORDANCE WITH PART E ROBUST DETAIL E-WM-33 (SUBJECT TO CONFIRMATION).

DPC TO LAP DPM/GAS MEMBRANE.

CONCRETE SCREED TO FINISH LEVEL WITH DPC, STRUCTURAL CONCRETE TOPPING TO BE GRADE RC25/30 WITH MAX. 20MM AGGREGATE AND REINFORCED WITH POLYPROPYLENE FIBRES OR ONE LAYER OF A142 MESH TO BS 8666:2005 ALL IN ACCORDANCE WITH THE BBA CERT 88/2059.

150MM OVERLAY SHEET. REFER TO JETFLOOR MANUFACTURERS DETAILS.

150MM JETFLOOR SYSTEM. REFER TO MANUFACTURERS DETAILS.

150MM MIN VENTILATION SPACE.

TECHNICAL TEAM TO CONFIRM REQUIRED U-VALUES.

RIGID EPS INSULATION WITH MIN. THERMAL CONDUCTIVITY OF 0.034W/mK INSTALLED BELOW DPC LEVEL.

REFER TO FOUNDATION SCHEDULE FOR FOUNDATION TYPE AND SIZE.

GROUND FLOOR DETAILS GENERIC NOTES:

BLOCK STRENGTHS MAY VARY,
REFER TO WORKING DRAWINGS & STRUCTURAL ENGINEERS CALCULATIONS.

NO GAS PRECAUTIONS SHOWN,
REFER TO ALTERNATIVE DETAILS.

TECHNICAL TEAM TO CONFIRM REQUIRED U-VALUES.

DETAILS APPLICABLE TO EXPOSURE ZONES:

- SHELTERED
- MODERATE
- SEVERE

FOR VERY SEVERE EXPOSURE ZONES REFER TO ALTERNATIVE DETAILS.

SEPARATING WALLS TO ROBUST DETAIL REF. E-WM-33.

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Rev.	Description	Drawn	Date

Project Title
STANDARD DETAILS
NORTH WEST REGION
JETFLOOR SYSTEM

Drawing Title
SEPARATING WALL DETAIL
E-WM-33
GAS MEMBRANE

Scale	Drawn By	Checked By	Authorised By
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APPENDIX V
GAS MEMBRANE SPECIFICATION SHEET



Technical Datasheet

Visqueen Gas Barrier NF-400

Features & benefits

- BDA Agrement Certification - third party accreditation
- Complies with NHBC Foundation NF94 guidance for use in Type A membrane locations - non foil system
- Complies with the methane gas transmission rate, mass per unit area and thickness requirements of BS 8485:2015 + A1:2019 - industry standard for methane and carbon dioxide protection
- Multi functional - also acts as a radon and damp proof membrane
- Dual jointing methods - depending upon specification, lap joints can be heat welded or taped

Product description

Visqueen Gas Barrier NF-400 is a co-extruded, multi-layer thermoplastic gas membrane, 0.4mm thick (400 micron). The membrane is blue on the upper surface, white on the underside and supplied 2.4m x 43.5m in a single wound roll.

Approvals and standards

- Third party accreditation (BDA Agrement Certificate BAB-24-339-P-A-UK)
- Complies with the methane gas transmission rate, mass per unit area and thickness requirements of BS 8485:2015 + A1:2019
- Suitable for all Characteristic Gas Situation (CS) ground gas regimes
- Complies with NHBC Foundation NF94 guidance for use in Type A membrane locations (non foil system)
- Conforms to the specification requirements of NHBC Amber 1 and Amber 2 applications
- Conforms to the specification requirements of BR 211:2023
- UKCA UKNI CE to EN 13967:2012
- Visqueen certified with Quality Management System ISO 9001:2015
- Visqueen certified with Occupational Health and Safety System ISO 45001:2018
- Visqueen certified with Environmental Management System ISO 14001:2015

Usage

Visqueen Gas Barrier NF-400 is suitable for use in all types of buildings to prevent the ingress of harmful levels of methane, carbon dioxide and radon.

The barrier can be positioned above or below reinforced cast in situ concrete floor slabs e.g. ground bearing, suspended or raft, or above precast suspended segmental subfloors, e.g. beam and block floor.

The barrier can also be used as a high performance radon membrane and/or damp proof membrane.

NHBC NF94 guidance: Radon, carbon dioxide, and methane protection
Visqueen Gas Barrier NF-400 when installed with either welded or taped joints complies with NHBC Foundation NF94 publication, Hazardous ground gas - an essential guide for housebuilders, in Type A membrane locations in precast suspended segmental subfloors and reinforced cast in situ concrete floor slabs (ground bearing, suspended or raft).

For site or zone characteristic gas situations of CS4 and above, contact Visqueen Technical Office.

The barrier is not intended for use where there is a risk of hydrostatic pressure.

System components

- VisqueenPro Double Sided Jointing Tape, 50mm x 10m
- VisqueenPro Detailing Strip, 300mm x 10m
- Visqueen TreadGUARD 1500, 1m x 2m
- Visqueen TreadGUARD 300, 2m x 75m
- Visqueen Ultimate Top Hat Units
- Visqueen NF-Detailing Strip, 300mm x 10m
- Visqueen NF-60 Lap Tape, 60mm x 45m
- Visqueen NF-150 Lap Tape, 150mm x 10m

Storage and handling

When storing Visqueen Gas Barrier NF-400 care should be taken to:
- store in its original packaging;
- avoid exposure to direct sunlight and high or low temperatures for prolonged periods of time;
- store in a well-ventilated covered area to protect from rain, frost, humidity and mechanical damage;
- store away from possible ignition sources;
- store rolls of the barrier horizontally on a flat surface and not stacked.

Care should be taken to avoid accidental damage to the product when handling on site.

Care should be taken when handling the product in line with current manual handling regulations.

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Visqueen Gas Barrier NF-400

Preparation

Visqueen Gas Barrier NF-400 should be installed with the blue side facing upwards onto a smooth, continuous surface. e.g. grouted beam and block floor, a compacted blinding layer e.g. 50mm thick sand blinding, or smooth concrete blinding. The substrate should be free from irregularities such as loose aggregates or other sharp protrusions, voids, projections or mortar deposits.

The barrier can be cut with a sharp retractable safety knife or robust scissors.

Hand rollers are required during lap joint formation and sealing membrane detailing. Typical hand rollers include 40mm silicone pressure roller and 6mm brass penny pressure roller.

Consult the project specification to ensure the correct method of lap joint formation for the project is followed (welded or taped).

Rolls of tape should be kept in a warm, dry location prior to use to ensure the tape is workable and can be more easily applied.

Installation

Installation of Visqueen Gas Barrier NF-400 should be carried out by a competent contractor experienced with this type of product e.g. hold an NVQ Level 2 Diploma in substructure work occupations (Installation of Gas Membranes - Construction).

The installation should be subjected to third-party validation in accordance with BS 8485:2015 +A1:2019 and CIRIA C735.

Visqueen Gas Barrier NF-400 should be loose laid on the substrate with the blue side facing upwards ensuring that the barrier sheet edges are aligned allowing adequate overlap for jointing between the sheets.

The barrier lap area should be clean and dry at the time of jointing. The barrier has been designed to exhibit superior welding properties using hot wedge and hot air welding, therefore onsite welding of all lap joints is recommended. When hot air hand welding the lap joints, the joint should be overlapped by approximately 100mm and an approximate 35mm weld is normally achieved. During hand welding, the lap joints should be firmly compressed using a hand roller to ensure an adequate bond is achieved.

When taping the lap joints, the joint should be overlapped by approximately 100mm and bonded with VisqueenPro Double Sided Jointing Tape (positioned approximately 25mm from the edge of the sheet) and sealed with Visqueen NF-60 Lap Tape or Visqueen NF-150 Lap Tape depending on the project specification. The lap joints should be firmly compressed using a hand roller during taping to ensure an adequate bond is achieved.

Creating an effective gas barrier often requires complex three-dimensional detailing, such as around internal and external walls, corners, doorway thresholds, service pipes, party walls, and structural columns. Visqueen NF-Detailing Strip is gas resistant and can be used in place of the gas barrier to maintain continuous protection. The detailing strip lap joints should be firmly compressed using a hand roller to ensure an adequate bond is achieved. Visqueen Ultimate Preformed Units are also available.

If the barrier is punctured or perforated a patch of the same material should be lapped at least 100mm beyond the limits of the puncture and either welded in position, or bonded with VisqueenPro Double Sided Jointing Tape (positioned approximately 25mm from the edge of the sheet) and sealed with Visqueen NF-60 Lap Tape or Visqueen NF-150 Lap Tape depending on the project specification. Alternatively a patch can be formed using Visqueen NF-Detailing Strip lapped at least 150mm beyond the extents of the puncture.

Long periods of exposure to ultraviolet light will reduce the effectiveness of the barrier. The barrier should be covered by a protective layer e.g. Visqueen TreadGuard protection or other approved protection material, immediately after installation to prevent damage from following trades, ultraviolet light, etc. Care should be taken to ensure that the barrier is not punctured, stretched or displaced during or post installation.

VisqueenPro Detailing Strip is also suitable for sealing detailing junctions and patch repairs, however when the gas protection measures are to conform with the requirements of NHBC NF94 guidance, please ensure acceptance by all stakeholders prior to use.

Usable temperature range

When Visqueen Gas Barrier NF-400 is installed with taped lap joints, the air temperature should not be below 5°C or falling to prevent the risk of surface condensation affecting the tape adhesion.

When ambient temperatures are above 25°C or rising, the barrier should be covered immediately after installation.

Additional information

When used in accordance BS8485:2015 + A1:2019 a subfloor ventilation system or pressure relief may also be required.

To assist build sequencing, Visqueen Ultimate Gas DPC is available for gas protection through the wall construction.

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Visqueen Gas Barrier NF-400

Technical Datasheet

For further information contact Visqueen Technical Office on 0333 202 6800.

The information in this datasheet was correct at the time of publication. It is the user's responsibility to obtain the latest version of the datasheet as it is updated on a regular basis. The information contained in the latest datasheet supersedes all previously published editions.

Property	Test method	Units	Compliance criteria	Result
Dimensions	BS EN 1848-2	m	-	2.4 x 43.5
Nominal thickness	BS EN 1849-2	mm	+/-10%	0.4
Mass	BS EN 1849-2	g/m²	>370	>370
Tensile strength - machine direction	BS EN 12311-2 method B	N/mm²	MDV	26.3
Tensile strength - cross direction	BS EN 12311-2 method B	N/mm²	MDV	29.4
Elongation at break - machine direction	BS EN 12311-2 method B	%	MDV	607
Elongation at break - cross direction	BS EN 12311-2 method B	%	MDV	921
Joint strength - taped joint	BS EN 12317-2	N/50mm	MDV	217
Joint strength - welded joint	BS EN 12317-2	N/50mm	MDV	405
Watertightness at 2kPa for 24 hours	BS EN 1928 method A	-	Pass/Fail	Pass
Watertightness at 2kPa for 24 hours after ageing	BS EN 1296 (12 weeks) + BS EN 1928 method A	-	Pass/Fail	Pass
Watertightness at 2kPa for 24 hours after alkali environment	BS EN 1847 (28 days) + BS EN 1928 method A	-	Pass/Fail	Pass
Resistance to impact	BS EN 12691 method A	mm	MDV	400
Low temperature flexibility	BS EN 495-5	°C	MDV	-20
Resistance to tearing (nail shank) - machine direction	BS EN 12310-1	N	MDV	265
Resistance to tearing (nail shank) - cross direction	BS EN 12310-1	N	MDV	240
Water vapour resistance	BS EN 1931 method B	MNs/g	MDV	2,296
Water vapour permeability	BS EN 1931 method B	g/m²/d	MDV	0.08
Water vapour resistance factor	BS EN 1931 method B	µ	MDV	1,140,000
Water vapour diffusion equivalent air layer thickness	BS EN 1931 method B	SD in m	MDV	459
Methane gas transmission rate - membrane	BS ISO 15105-1	ml/m²/day/atm	MDV	13.2
Methane gas transmission rate - welded membrane joint	BS ISO 15105-1	ml/m²/day/atm	MDV	15
Carbon dioxide gas transmission rate	BS ISO 15105-1	ml/m²/day/atm	MDV	22
Radon gas transmission rate - membrane	SP method	m/s	MDV	<3.0 x 10-9
Puncture CBR	BS EN 12236	N	MDV	1620
Tensile yield strength - machine direction	ASTM D4885-01	kN/m	MDV	8

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Visqueen Gas Barrier NF-400

Tensile yield strength - cross direction	ASTM D4885-02	kN/m	MDV	7.3
Resistance to static loading	BS EN 12730 method C	kg	MDV	15
Elongation yield - machine direction	ASTM D4885-01	%	MDV	405.3
Elongation yield - cross direction	ASTM D4885-01	%	MDV	400.2
Tear resistance - trouser method A - machine direction	BS ISO 34-1	kN/m	MDV	128
Tear resistance - trouser method A - cross direction	BS ISO 34-1	kN/m	MDV	109.7
Tear resistance - angle method B - machine direction	BS ISO 34-1	N	MDV	137
Tear resistance - angle method B - cross direction	BS ISO 34-1	N	MDV	139.6

Health and safety information

Refer to the Visqueen Gas Barrier NF-400 safety datasheet (SDS).

About Visqueen

Visqueen is a leading provider of construction membrane technologies and design-based solutions for ground gas, structural waterproofing, damp proofing and fire protection.

We offer complete support at every stage of the specification, including the supply chain process. As the UK's principal technical authority, we are best placed to ensure that the principal designer and contractor specify the most technically suited, durable, and competitive solution to guarantee their project is protected for the lifetime of the building.

Visqueen is at the forefront of advanced membrane technology and innovation in the construction industry, earning the trust and loyalty of specifiers throughout the UK and Europe.

For more information, visit visqueen.com or contact our sales office at +44 (0) 333 202 6800 or enquiries@visqueen.com

Complete Range, Complete Solution



Passive Fire Protection | Gas Protection | Damp Proof Membrane | Air and Vapor Control | Stormwater | Damp Proof Course | Temporary Protection

Visqueen Technical Support

Visqueen offer a comprehensive full nationwide technical support. Our team of CSSW qualified technical support managers provide on site design-based solutions for specifiers, contractors and builders merchants, and will ensure that from design stage to installation the project is fully risk assessed and the specification is approved by all stakeholders.

Our Technical Office, can design, prepare and manage CAD detailing, together with assisting in quantity take offs, while offering advice on technical installations and product selection.

Competency & Design

Visqueen promotes competency in building design by ensuring that its technical team possesses the necessary skills, knowledge, experience, and ethical practices. The company adopts the "golden thread of information," ensuring all project data is digitally secure and accessible throughout a building's lifecycle. This approach aligns with the Building Safety Act and aims to foster accountability and compliance with evolving regulations, providing clients with confidence in the safety and reliability of their projects.

Visqueen CPD Seminars

Visqueen's CPD Seminars offer insights into Building Regulations, Standards, and industry guidance related to damp proofing, hazardous ground gas protection, and structural waterproofing. These one-hour seminars are

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Visqueen Gas Barrier NF-400

tailored for construction design professionals and delivered by our Technical Support Managers. Visit our website to book a free CPD.

Visqueen Contract Design Services

Visqueen Contract Design Services offers a bespoke design service led by our team of Certified Surveyors in Structural Waterproofing (CSSW), providing experienced and specialised waterproofing design expertise for complex projects. We provide comprehensive support throughout the entire project, ensuring that all work meets the requirements of warranty providers and adheres to the highest standards of quality, reliability and current legislation.

Visqueen Training Academy

Based at our Derbyshire facility, the Visqueen Training Academy offers a variety of training programs across the UK. These include one-day product awareness sessions for distributors and builders' merchants, and intensive two-day courses for hands-on product installation training. Contact us for more information.

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