



GEOSHIELD
Verification
PLAN



PROJECT DESCRIPTION

Pre Verification Plan for the Ground Gas Membrane at the Clarendon Road redevelopment Phase 3, former Hornsey Gasworks located at:

Clarendon Road
Hornsey
N8 0JU

Atkins Limited have produced Remediation Strategy based on the findings of the Geotechnical Survey Report. The strategy confirms the site is CS2 with continued monitoring form VOCs.

Phase 3 of the development consists of 4 residential blocks - Blocks D1, D2, D3 and D4. Under BS8485:2015+2019 the building type is classed as Type A. Therefore 3.5 points are required from the ground gas protection system.

This Pre Verification Plan reviews the proposed design and material specification and confirms it is compliant with the requirements of BS8485:2015+2019.

To ensure the relevant Planning Condition is discharged the installation of the ground gas protection system will be tested and documented in accordance with CIRIA 735. On successful completion of the works the subsequent reports are to be issued to The Local Planning Authority for approval.



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Section 1:

GEO100/GCL/ClarendonRoadPHASE3

PROJECT:

GCL - Clarendon Road - Phase 3

PROJECT ADDRESS:

Clarendon Road - Phase 3

East of Mary Neuner Road, Hornsey, N22 6UG

SPECIFICATION:

Verified in accordance CIRIA 735.

Design in accordance with BS8485 2015 + 2019 for Methane and Carbon Dioxide.

Substrate prepared in-accordance with manufactures instructions and BS8485

Pudlo GP Ultra+ Gas Barrier

Pudlo GP Ultra Tape

Pudlo GP Ultra EXT Tape

Pudlo GP Ultra Seal

Pudlo Liquid Gas Barrier



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SPECIFICATION:

INFORMATION INCLUDED:

Material specification technical data sheets

5192204/P3_RemStrat Rev0.4

W257-PUD-D1-00-DR-S-02-1000

W257-PUD-D2-00-DR-S-02-1001

W257-PUD-D3-FN-DR-S-02-1002

W257-PUD-D3-XX-DR-S-02-1005

W257-PUD-D3-XX-DR-S-05-1000

W257-PUD-D4-00-DR-S-01-1006

W257-PUD-D4-BL-DR-S-02-1003

W257-PUD-DD-XX-DR-S-03-0001 to W257-PUD-DD-XX-DR-S-03-0024

W257-PUD-DD-XX-SK-S-03-0001 to W257-PUD-DD-XX-SK-S-03-0003

Information presented to at the pre-verification stage assumed correct

Any change client will let GeoShield know or this Pre-verification Plan will be void.



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SURVEYOR:

Chris Ingham

VERIFICATION COMPANY:

GeoShield Limited

Icon Business Centre

4100 Park Approach

Thorpe Park

Leeds

CONTACT NUMBER:

07555 214 679

EMAIL ADDRESS:

CIngham@geoshield.co.uk

ORDER NUMBER:

To be confirmed

PER VISIT:

YES:



NO:



PROJECT:

YES:



NO:





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SPECIFICATION



Phase 3, Clarendon Road, Hornsey

Remediation Strategy

St William Homes LLP

May 2020



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Notice

This document and its contents have been prepared and are intended solely as information for St William Homes LLP and use in relation to Phase 3 of the former Hornsey Gasworks at Mary Neuner Road, Hornsey, N22 6UG.

SNC Lavalin assumes no responsibility to any other party in respect of or arising out of or in connection with this document and/or its contents.

Document history

Revision	Purpose description	Originated	Checked	Reviewed	Authorised	Date
Rev 1.0	Draft for Comment	VG	AN	AN	NK	14/02/2020
Rev 2.0	Final	VG	AN	AN	NK	20/02/2020
Rev 3.0	Final – following regulator comments	VG	AN	AN	NK	22/04/2020
Rev 4.0	Final – following regulator comments	AN	AN	AN	NK	13/05/2020

Client signoff

Client	St William Homes LLP
Project	Phase 3, Clarendon Road, Hornsey
Job number	5192204



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6.7. Gas and Vapour Mitigation

6.7.1. Ground Gas

Based on the ground gas risk assessment the site has been characterised as CS2 and therefore gas risk protection measures are required as part of the development. The following gas protection measures are recommended:

- Blocks D1 – D3 (without basement): a combination of the proposed suspended slab and gas resistant membrane or a dispersal layer is proposed for the Blocks D1-D3 in the northern area. Due to the greater relative difficulty in implementing a dispersal layer, it would usually be recommended that a gas resistant membrane is installed;
- Assuming the membrane solution is selected, any gas resistant membrane proposed for Blocks D1 – D3 shall meet all of the following criteria:
 - sufficiently impervious to the gases with a methane gas transmission rate $<40.0 \text{ ml/day/m}^2/\text{atm}$ (average) for sheet and joints (tested in accordance with BS ISO 15105-1 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, etc);
 - capable, after installation, of providing a complete barrier to the entry of the relevant gas; and
 - verified in accordance with CIRIA C735.
- Blocks D4 and E1-E3 (with basement): no additional gas protection measures are required as the underground basement is assumed to be vented in addition to the gas resistance provided by the basement floor and wall construction itself. It is recommended that the service penetrations should be limited in number and sealed using 'top hats', to avoid introducing pathways for gas ingress into the basement.

6.7.2. Vapours from Soil and Perched Water

Assessment of potential risk from the migration of vapours into structures from soil identified the following recommendations/actions:

- Installation and verification of an appropriate soil vapour resistant barrier membrane protective of the contaminants identified to pose an unacceptable risk in key areas in accordance with industry good practice guidance [1] [3] [4] [16]; and

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- Excavation and disposal of visual and olfactory contamination in Made Ground (where identified).

CIRIA C748 [17] provides guidance on the selection of appropriate vapour protection barriers, which should be undertaken in consultation with a specialist provider and the building designer. The selection should consider the following key properties to ensure fitness for use and prevent damage during construction activities:

- Membrane thickness;



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CIRIA C748 [17] provides guidance on the selection of appropriate vapour protection barriers, which should be undertaken in consultation with a specialist provider and the building designer. The selection should consider the following key properties to ensure fitness for use and prevent damage during construction activities:

- Membrane thickness;
- permeation rate for the contaminants of concern at various concentrations;
- tensile strength;
- puncture resistance;
- impact resistance; and
- tear resistance.

The detailed design of these protective measures including product selection and installation details is outside the scope of this report but should be addressed in conjunction with the building designer. In addition to the items detailed above, the membrane should comply with the following:

- sufficiently durable to remain serviceable for the anticipated life of the building and duration of any 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, etc);
- capable, after installation, of providing a complete barrier to the entry of the relevant contaminants; and
- verified in accordance with CIRIA C735 [18].

A gas and vapour membrane specification is provided in Appendix D.

6.7.3. Verification of Gas and Vapour Membranes

Verification of the vapour and gas protection measures should be in accordance CIRIA C716 [19] and C735 [18] respectively, which provide advice on verification approaches relevant to different scenarios and protection measures.

The verification should include as a minimum;

- a verification report including a description of any measures installed – textual, photographic records, as-built construction drawings;
- details of who installed the measures and relevant warranties;
- details of who inspected or verified the installation/s and a description of how this took place, together with any constraints (i.e. areas that could not be inspected or tested) or other issues of uncertainty;
- verification test results, outcomes of inspections and compliance data should be provided, either within the main text or as an annex to the report; and
- details of any defects identified, together with corrective actions and subsequent verification checks.

Verification of gas protection measures will require approval via the LB Haringey as well as any other building control bodies involved in the scheme (i.e. NHBC).

6.8. Perched Water and Surface Water Management

Shallow groundwater / perched water encountered within excavations will be removed, tested and discharged to foul sewer wherever possible, under an appropriate discharge consent. Should free phase hydrocarbon product be encountered at any point during intrusive works on site, this will be removed via pumping/excavation in line with the earthworks and remediation contractor's



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SPECIFICATION



Part of the DB Group

PRODUCT DATA SHEET

PUDLO GB Ultra+

DESCRIPTION

PUDLO GB Ultra+ is a dual performance membrane that provides protection from gas including VOC's, Carbon Dioxide, Methane, Radon, Hydrocarbons and protects the structure from water ingress. **PUDLO GB Ultra+** is a multi-layer, polythene membrane which is fleece-backed (black fluffy side up) providing a fully bonded system to the concrete.

USES

For all aspects of gas protection and where a Grade 3 (waterproofing) environment is required as part of a dual system recommended in BS8102:2009. **PUDLO GB Ultra+** can be used in horizontal or vertical application. **PUDLO GB Ultra+** is suitable for all ground floor and basement construction including lift pits, slabs, liner walls, capping beams and service penetrations. **PUDLO GB Ultra+** can also be used as single system.



BENEFITS

- Recognised as an accepted system for gas and water protection by NHBC.
- Full surface contact between the membrane and concrete.
- Quick and easy installation.
- Can be installed in all weather conditions.
- No requirement for priming. Overlaps are sealed by hot welding or joint tape (dependant on gas present).

PUDLO GB Ultra+ is pre-applied with the fleece backed material side facing outwards towards the concrete. **PUDLO GB Ultra+** is classified as Type A (Barrier) system in accordance with BS 8102:2009. **PUDLO GB Ultra+** hydrocarbon barrier offers a safe solution for the protection of buildings and its occupiers against all levels of hydrocarbons, methane, carbon dioxide and radon. **PUDLO GB Ultra+** is manufactured and designed to withstand most aggressive environments.

TECHNICAL DATA

Testing has been completed and carried out in accordance with the new test criteria under BS 8485:2015 and CIRIA C748 to determine the permeation rates for a range of VOC's, methane and Carbon Dioxide. Immersion testing has been completed for chemical resistance to EN 1441 and EN 14415.

Physical Properties

Characteristics	Test Method	Unit	PUDLO GB Ultra+
Thickness	EN 1849-2	mm	1.0
Width	EN 1849-2	M	1.9
Length	EN 1849-2	M	25
Weight	EN 1849-2	g/m ²	700



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PRODUCT DATA SHEET

Hydraulic Properties

Characteristics	Test Method	Unit	PUDLO GB Ultra+
Water Vapour Rate	EN 1931	g/m ² /day	0.14
Water Tightness (60kPa)	EN 1928	-	PASS
Water Tightness (196kPa – 20m water head)	EN 1928	-	PASS

Mechanical Properties

Characteristics	Test Method	Unit	PUDLO GB Ultra+
Resistance to Static Load	EN 12730	Kg	>20
Tensile Strength (MD)	EN 12311-1	N/50mm	>550
Tensile Strength (CMD)	EN 12311-1	N/50mm	>400
Tear Resistance (MD)	EN 12310-1	N	>300
Tear Resistance (CMD)	EN 12310-1	N	>300
Resistance to Impact	EN 12691-B	N	650
Reaction to Fire	EN ISO 11925-2	Class	E
Concrete Peel Adhesion	ASTM D903 (mod)	Kn/M	>3.0
Resistance to Artificial Ageing	EN 1296	-	PASS
Resistance to Chemicals	EN 1847	-	PASS

Vapour Permeability – 100% Concentration

Characteristics	Test Method	Unit	PUDLO GB Ultra+
Transmission Rate of Benzene	EN ISO 15105-2	mg/m ² /day	2250
Transmission Rate of Toluene	EN ISO 15105-2	mg/m ² /day	2370
Transmission Rate of Ethyl Benzene	EN ISO 15105-2	mg/m ² /day	400
Transmission Rate of Xylene (m,p,o)	EN ISO 15105-2	mg/m ² /day	690
Transmission Rate of Hexane	EN ISO 15105-2	mg/m ² /day	95.25
Transmission Rate of Vinyl Chloride	EN ISO 15105-2	mg/m ² /day	36.44
Transmission Rate of Trichloroethene (TCE)	EN ISO 15105-2	mg/m ² /day	1.44
Transmission Rate of Tetrachloroethene (PCE)	EN ISO 15105-2	mg/m ² /day	1.59

Gas Permeability

Characteristics	Test Method	Unit	PUDLO GB ULTRA+
Methane Permeability	EN ISO 15105-1	ml/m ² /day/atm	0.13
Methane Permeability (Welded Joint)	EN ISO 15105-1	ml/m ² /day/atm	1.00
Carbon Dioxide Permeability	EN ISO 15105-1	ml/m ² /day/atm	3.01
Transmission rate of Vinyl Chloride Gas	EN ISO 15105-1	ml/m ² /day/atm	0.04
Radon Permeability	SP Method 3873	m ² /s	3.0 x 10 ⁻¹²

Certification 7 Compliance

Organisation	Requirements
CE Mark	EN13967
NHBC	Chapter 5.4 & Traffic Light System
BS 8485:2015	Methane, Carbon Dioxide
CIRIA C748	VOC Barrier
BS 8102:2009	Type A (Barrier)

PUDLO GB Ultra+ complies with the latest codes of practice as set out by BRE, CIRIA C748, BS 8485:2015 and BS 8102. PUDLO GB Ultra+ is also suitable for use as a ground gas / Hydrocarbon protection from NHBC under the traffic light system (Green, Amber 1, Amber 2 and Red sites).



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PRODUCT DATA SHEET

MEMBRANE OVERLAPS

Membrane overlaps are sealed using 2 different methods. The method of sealing overlaps is determined what gases are present and at what level following the review from the 3rd party gas verification plan. These methods are as follows:

VOC (Volatile Organic Compound) = Hot Welded Joints only.

Carbon Dioxide and Methane = Hot Welded Joints or Tape (Dependent on gas verification report).

Radon = Tape only.

Note: PUDLO do not offer a warranty on gas protection only for waterproofing. Gas membrane installation when hot welding must be carried out by a 3rd party approved installer.

PACKAGING

1.9m x 25m roll. (47.5m²). Roll Weight = 35kg

ANCILLARY PRODUCTS

- PUDLO GB Ultra Tape (100mm selfedge overlap tape)
- PUDLO GB Ultra EXT Tape (300mm roll end tape)
- Surestop BWB
- Surestop SWB
- Surestop Adhesive
- Surestop SM
- Surestop Voidformer

HEALTH & SAFETY

PUDLO GB Ultra+ rolls are heavy and may need mechanical lifting. Please refer to **PUDLO GB Ultra+** MSDS for more information.

FIRE

PUDLO GB Ultra+ is a product that is non-toxic nor flammable.

STORAGE & SHELF LIFE

PUDLO GB Ultra+ has a shelf life of 12 months when kept in dry conditions at a temperature of 5°C to 45°C. Storage at higher temperatures and high humidity may reduce the shelf life of the product.

For further information on accessories that are used with **PUDLO GB Ultra+** please contact PUDLO Head Office on 01954 780687 or email sales@pudlo.com.





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Product data sheet

PUDLO Liquid GB

Description

PUDLO Liquid GB is a styrene, butadiene, latex-based liquid system.

PUDLO Liquid GB prevents gas penetration for Methane, Radon, Carbon Dioxide, air and moisture into buildings.

Uses

- PUDLO Liquid GB is used for the sealing of pile heads, prior to concrete slabs being cast across the top
- PUDLO Liquid GB is a barrier to moisture and can be used as a DPM on both floors and walls

Benefits

- Easy to apply
- Provides an effective gas and moisture vapour barrier
- Packaged in 15kg tubs
- Roll, brush or spray applied

Application

Refer to PUDLO GP Ultra+ installation manual.

Coverage /yield

A minimum dry-coated thickness of 1mm is needed to provide an adequate gas barrier.

To achieve 1.0mm thickness, a total of 2kg/m² is required. One 15kg tub will cover an area of 7.5m².



Packaging

15kg tubs - 33 tubs per pallet.

PUDLO supplies a 120mm x 5m reinforcing strip with every 3 tubs, for detailing around upstands and changes in level or angles.

Ancillary products

- PUDLO GP Ultra Range (all membranes)
- PUDLO Detailing Strip
- Surestop BWB / Surestop SWB (sealing construction joints)
- Surestop SM
- Surestop Adhesive
- Surestop Voidformer

Gas & Waterproofing - Below Ground - PUDLO Liquid GB

T: 01954 780687 W: pudlo.com E: sales@pudlo.com





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Product data sheet

Health & safety

Appropriate care must be taken when manual handling the product. After use, please ensure all tools are clean.

Fire

Refer to PUDLO Liquid GB MSDS for more information.

Storage & shelf life

Store tubs in dry conditions between 50C and 300C. Product has a 12-month shelf life.

For further information on accessories that are used with PUDLO Liquid GB please contact PUDLO Head Office on 01954 780687 or email technical@dbgholdings.com.

Technical data

PUDLO Liquid GB complies with the latest codes of practice, as set out by BR211, CIRIA and BS 8485:201. PUDLO Liquid GB is also suitable for use as a gas protection measure for NHBC, under the traffic light system (Green, Amber 1, Amber 2 and Red sites).

Physical properties

Characteristics	Test method	Unit	PUDLO GP Ultra+
Applied thickness	-	mm	>1.0
Form supplied	-	-	Viscous liquid
Pack size	-	-	15kg
Colour	-	-	Pink / purple
Chemical composition	-	mm	Advances SBS with specialty additives

Physical properties

Characteristics	Test method	Unit	PUDLO GP Ultra+
Water tightness	EN 1296, EN 1367, EN 1928	-	PASS
Methane permeability	BS EN ISO 15105-1	ml/m ² /day/atm	0.01
Radon permeability	Saarland University GER	mm	>1.0mm applied thickness provides a complete barrier to Radon

Gas & Waterproofing - Below Ground - PUDLO Liquid GB