



Reference: **072-20-541.2381**

Date: **25th June 2020**

Ian Thomas Construction Ltd

Brynawelon
Llanfynydd
Carmarthen
SA32 7TG

For the Attention of: Mr Rhydian Thomas

**CEFN SEASON SCHOOL, AFAN VALLEY ROAD, CIMLA
GAS VALIDATION REPORT**

Dear Rhydian,

Further to your request we are pleased to present the gas validation report for the installation of gas protection measures at the above named site.

1.0 INTRODUCTION

The development comprises the construction of a new school development. The building is to be constructed on concrete foundations with reinforced concrete ground bearing slab together with a gas membrane to provide the necessary gas protection.

Typical scheme details showing the membrane details are presented in the gas protection Verification Plan for the development, a copy of which is provided in Appendix I.

2.0 VERIFICATION WORKS

The site has been visited on a total of seven occasions as follows:

- 27th February 2020 – Phase 1A - Sports Hall
- 12th March 2020 – Phase 1A - Sports Hall
- 8th April 2020 – Phase 2 – Block A
- 22nd April 2020 – Phase 2 – Block A
- 12th May 2020 – Phase 4A Pour 1
- 22nd May 2020 – Phase 4B Pour 2
- 29th May 2020 – Phase 3 - Main Hall

The observations made during the site visits included the placement of the gas membrane and the sealing of joints with gas resistant tape and the sealing of details such as penetrations with SAGM where required. The general standard of the installation works was also observed.

3.0 INSPECTION FINDINGS

The findings of the inspections are as follows:

The membranes installed were a Visqueen Gas Barrier and SAGM the technical data sheets for which is included in the Verification Plan and specification drawings are also included in the Verification Plan.



The membrane has been installed to an appropriate standard in general accordance with the manufacturers specifications with all joints and penetrations sealed. Photographs showing the general standard of the installation are included in Appendix II. The site inspection records are included in Appendix III.

The general standard of the installation works was good and care was being taken to protect the membrane during the installation works.

Further to these inspections we can confirm that the gas protection measures installed within the development meet the required standard.

We trust this meets with your requirements and please contact us with any queries

Yours sincerely
for **ASL**

MARCUS DAVIS
Projects Director

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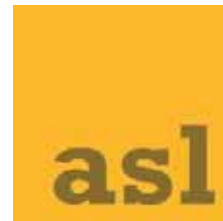
Enc.

Appendix I: Verification Plan
Appendix II: Photographs
Appendix III Site Inspection Records



APPENDIX I

VERIFICATION PLAN



Reference: **072-20-541.2325**

Date: **26th February 2020**

Ian Thomas Construction Ltd

Brynawelon
Llanfynydd
Carmarthen
SA32 7TG

For the Attention of: Mr Rhydian Thomas

**CEFN SEASON SCHOOL, AFAN VALLEY ROAD, CIMLA
GAS VERIFICATION PLAN**

Dear Rhydian,

Further to your request we are pleased to present the gas protection verification plan for the installation of gas protection measures for the above named site.

1.0 INTRODUCTION

The development comprises the construction of a new school development. The building is to be constructed on concrete foundations with reinforced concrete ground bearing slab together with a gas membrane to provide the necessary gas protection. Typical scheme details showing the membrane and venting details are presented in Appendix I.

The gas protection measures have been recommended in the Site Investigation Report, Report Ref A1104444, dated May 2019, produced by Morgan Sindall. Relevant extracts of the report are included in Appendix II.

2.0 GAS PROTECTION REQUIREMENTS

The design, installation and verification of the gas protection measures is based on the ground gas assessment and recommendations included in the site investigation report.

The design of gas protection measures for new buildings is based on BS8485 (2019) 'Code of practice for the design of protective measures for methane and carbon dioxide ground gases in new buildings'.

The report findings in respect of ground gas are summarised as follows:

The results of the monitoring indicated methane at a maximum concentration of 7.8%, carbon dioxide at a maximum concentration of 7.6% and a steady flow rate of 1.2l/hr. These results are considered to warrant the incorporation of ground gas protection.

The ground gas conditions identified are considered to require gas protection for new buildings based on Characteristic Situation 2 (CS2 – low risk) in general accordance with BS8485. CS2 requires a gas protection solution equating to at least 2.5 points for a Type C public building which has central building management control of maintenance of the building and has civil engineering construction.



The gas protection will be provided by a gas membrane installed, verified and validated in accordance with BS8485 to give 2.0 points and a reinforced ground bearing floor slab to give at least 0.5 points which results in the required 2.5 points.

In accordance with the requirements for gas protection measures and given the nature of the development and the low risk rating, the new development requires the incorporation of gas protection measures as follows:

- Visqueen gas barrier system laid beneath the slab - Gas Barrier, Gas Resistant Tape, Self-Adhesive Membrane;
- Reinforced ground bearing slab.

All joints will be sealed by welding or taping, including both double-sided tape and lap tape, to the manufacturer's specification. All penetrations through the slab and corner details will be sealed in accordance with the manufacturer's specification, using the prefabricated top-hats or corners or Visqueen gas membrane cut and fabricated to fit insitu and sealed using the self-adhesive gas membrane.

The data sheets for these products are attached in Appendix III.

3.0 INSTALLATION

The gas venting and membrane is to be installed by Ian Thomas Construction Ltd, an experienced general builder and groundworker. Method statements for the installation are to be provided by the installer to the verifier in advance of any installation works.

4.0 VERIFICATION AND INSPECTION WORKS

The verification will be carried out in general accordance with CIRIA C735 'Good practice on the testing and verification of protection systems for buildings against hazardous ground gases' and will comprise visual inspection.

Based on the guidance for CS2 and given the nature of the buildings the verification will comprise site visits by an independent verifier (ASL) to inspect the installed membranes prior to all concrete pours.

The independent verification inspection visits will be carried out by ASL in general accordance with the method statement included in Appendix IV. ASL are a geo-environmental consultancy and the inspection will be carried out by geotechnical engineers and geo-environmental scientists who are experienced in these works and have been suitably trained.

The inspections will include detailed visual inspection of the membrane integrity, the quality of all seams and sealing around penetrations such as pipes.

The verifier will request that any defects in the membrane or seals identified by a visual inspection are suitably repaired by the installer before confirming that the gas protection measures have been suitably installed. The findings of each verification visit will be recorded on a suitable pro-forma sheet presented in Appendix V.

Photographs will be taken showing the general level of workmanship and will show the membrane, seals and any other details that require specific installation techniques. The verifier will confirm that suitable protection will be used to protect the installed membrane as soon as practical following placement to reduce the risks of the membrane becoming damaged.



The verification works will be carried out in accordance with the ASL Method Statement, presented in Appendix IV.

5.0 VERIFICATION REPORTS

The results of the verification process will be detailed in a verification report. The report will confirm that the gas membrane installed is appropriate and it has been installed in accordance with the specification/drawings detailed in the design and to a high level of workmanship with no visible defects in the membrane or welds and seals.

We trust this meets with your requirements and please contact us with any queries.

Yours sincerely
for **ASL**

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Projects Director

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Enc.

Appendix I: Scheme Drawings
Appendix II: Site Investigation Report (Extract)
Appendix III: Data Sheets
Appendix IV: Method Statements
Appendix V: Verification Record Sheet

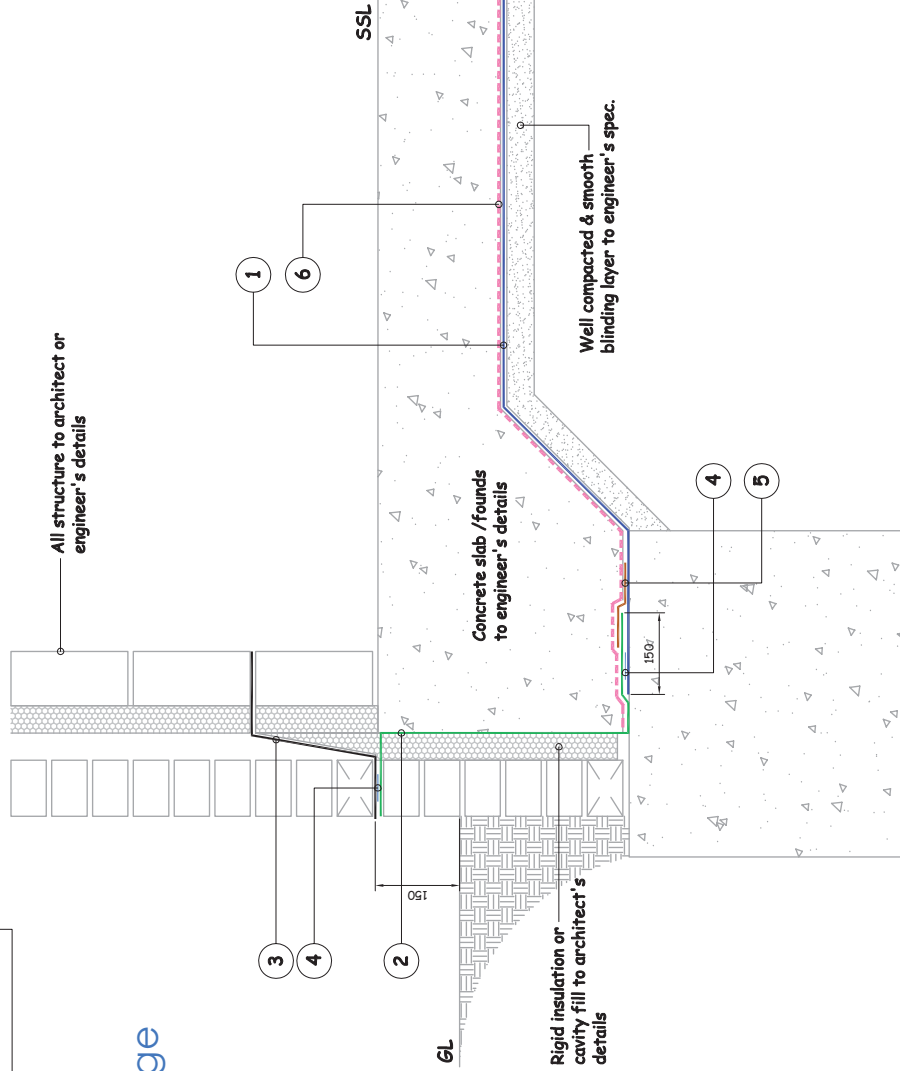


APPENDIX I

SCHEME DRAWINGS

Key to Materials :-	
1	Visqueen Gas Barrier
2	Visqueen GR DPC
3	Visqueen Zedex CPT DPC
4	Visqueen 50mm Double Sided Tape
5	Visqueen 150mm GR Lap Tape
6	Visqueen TreadGUARD 1500

Typical Slab Edge Detail

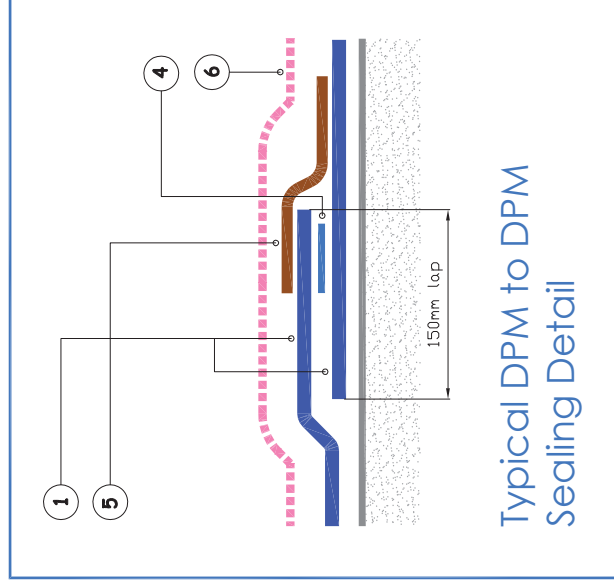


In order to develop a robust design for protecting a structure against groundwater, a risk assessment must be carried out in line with the guidance given in BS8102:2009

The designer may need to specify one or a combination of waterproofing measures

Site construction sequencing should be assessed before the appropriate Visqueen Standard Detail is selected & approved by the Designer

Detail Issued For Guidance Only,
Designer's Approval Required



NB : DO NOT SCALE - USE FIGURED DIMENSIONS ONLY.



Visqueen Building Products
Contact Technical Support :
t : 0333 202 6800
f : 0333 202 6886
e : enquiries@visqueenbuilding.co.uk
www.visqueenbuilding.co.uk

Project: Typical Edge Detail

Drg No : 4242-01

Date : July 2017

Scale : nts

TSM : AG

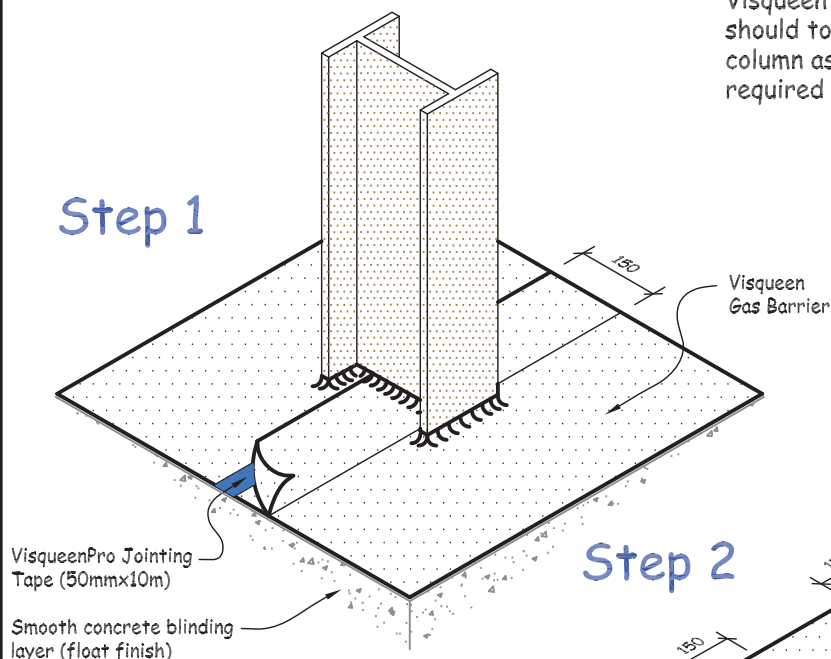
© COPYRIGHT RESERVED.

All laps must be fully sealed.

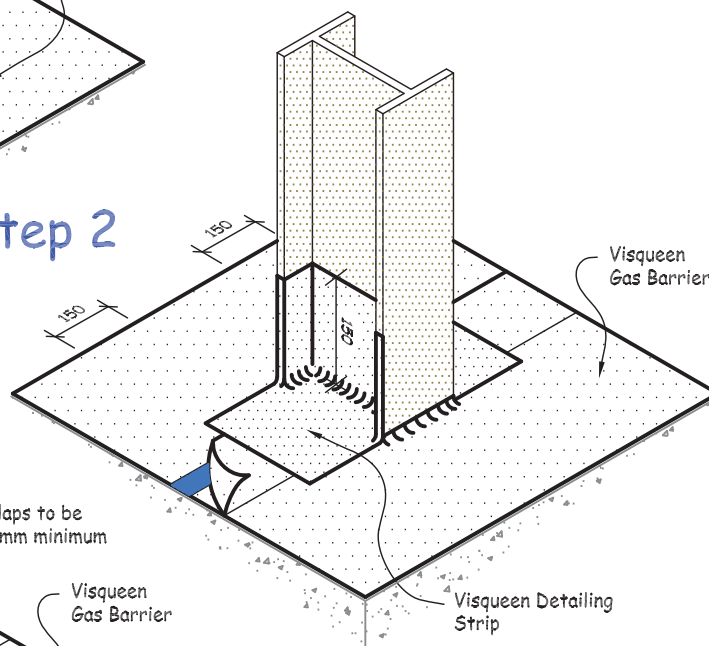
Detail Issued For Guidance Only,
Designer's Approval Required

All surfaces to be primed before applying Visqueen Detailing Strip. The Detailing Strip should be cut and dressed up the primed steel column as shown. Special detailing measures required when ground movement anticipated.

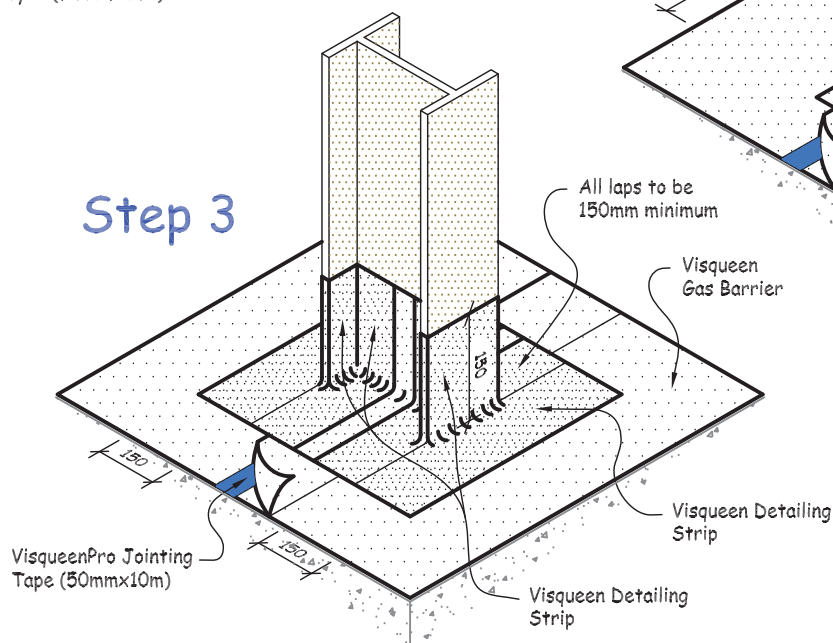
Step 1



Step 2



Step 3



NB; DO NOT SCALE - USE FIGURED DIMENSIONS ONLY.

Site construction sequencing should be assessed before the appropriate Visqueen Standard Detail is selected & approved by the Designer



Visqueen Building Products
Contact Technical Support :
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Project: Standard Detail : Sealing Method Around Universal Column Penetration (Slab Junctions Only).

Drawing No.- GB-22.

Date.- 11/11.

Scale.- NTS.

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All laps must be fully sealed.

Detail Issued For Guidance Only,
Designer's Approval Required

Site construction sequencing should be assessed before the appropriate Visqueen Standard Detail is selected & approved by the Designer

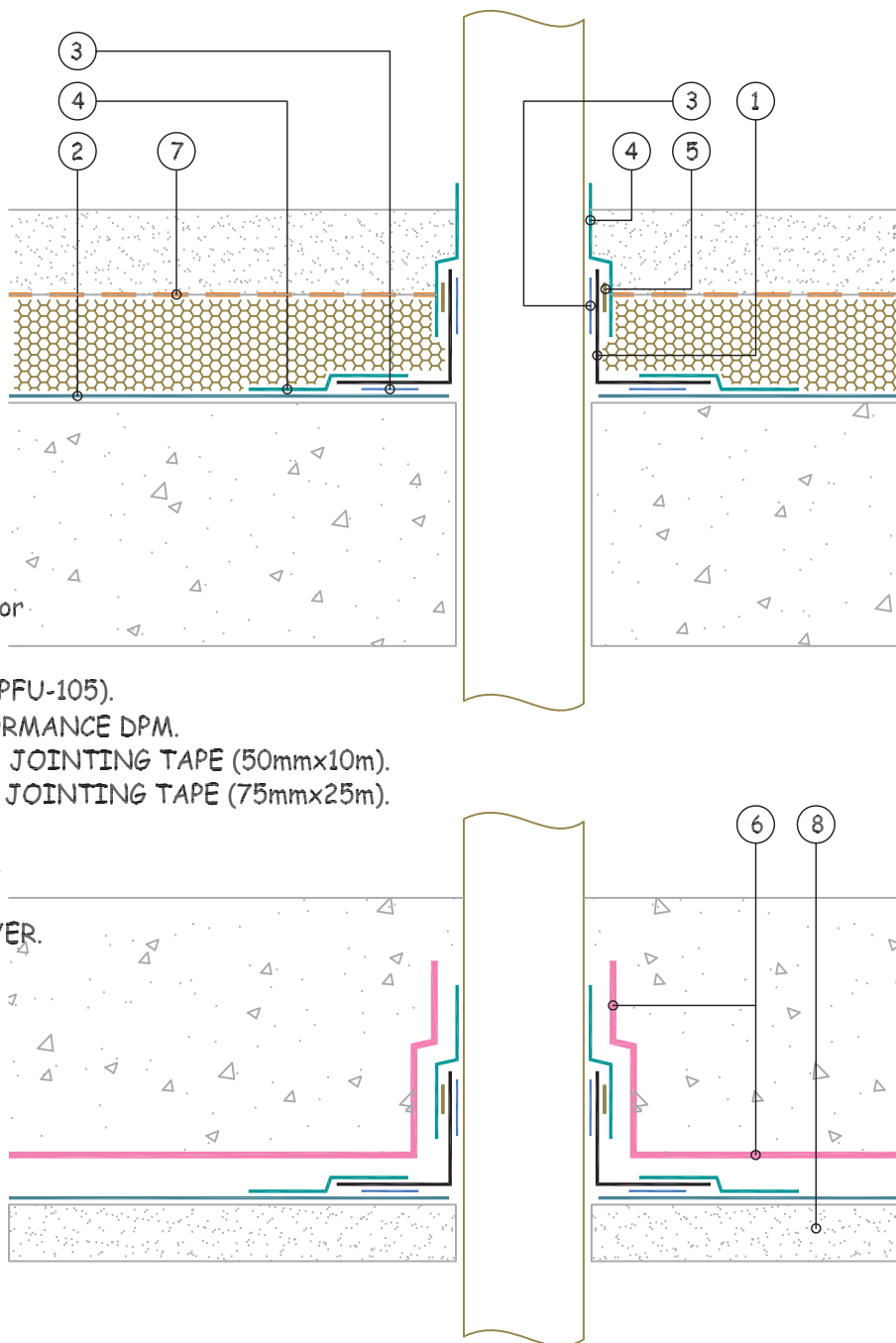
MEMBRANE ABOVE SLAB or BEAM & BLOCK FLOOR

KEY TO MATERIALS :

(Refer to Visqueen Technical Data for full detailed material specification).

- 1) PREFORMED PIPE SLEEVE (SEE PFU-105).
- 2) VISQUEEN 500um HIGH PERFORMANCE DPM.
- 3) VISQUEENPRO DOUBLE SIDED JOINTING TAPE (50mmx10m).
- 4) VISQUEENPRO SINGLE SIDED JOINTING TAPE (75mmx25m).
- 5) JUBILEE CLIP.
- 6) VISQUEEN TREADGUARD 1500.
- 7) VISQUEEN VAPOUR BARRIER.
- 8) SMOOTH SAND BLINDING LAYER.

MEMBRANE BELOW SLAB



NB: DO NOT SCALE - USE FIGURED DIMENSIONS ONLY.



Visqueen Building Products
Contact Technical Support :
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e : enquiries@visqueenbuilding.co.uk
www.visqueenbuilding.co.uk

Project: Standard Detail : Pipe Sleeve (Top Hat).

Drawing No.- HP-18.

Date.- 06/13.

Scale.- NTS.

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APPENDIX II

**GEO-ENVIRONMENTAL REPORT
(EXTRACTS)**



Morgan Sindall Group

Cefn Saeson CS, Cimla

Ground Investigation Report

May 2019

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Document Control

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Date:	04 March 2019		
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Description of revision: Draft report issued for client review and comments			
Revision:	V2 Final		
Date:	May 2019		
Prepared by: Jonathon Parr	Checked by: Adam James Paul Vincent	Approved By: Ian Viney	
Description of revision: Draft report issued with updated geotechnical section			



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Figure 2 – Exploratory Hole Location Plan

Figure 3 – SPT vs Depth

Figure 4 – Section 1

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26W007-WSP-V2-FN-SK-S-16-5004 to 7 (Development Proposal Drawings)

Appendices

Appendix A – Report Conditions

Appendix B – Exploratory Logs

Appendix C – Ground Gas and Groundwater Monitoring Results

Appendix D – Geotech Results

Appendix E – Environmental Laboratory Results

Appendix F – CIRIA C552 Methodology

Executive Summary

The Site	The site is located in a field adjacent to Cefn Saeson Comprehensive School on Afan Valley Road, Castell-Nedd/Neath, SA11 3TA. The site is approximately 6 hectares (ha) in size and is centred on National Grid Reference (NGR) SS 773 960.
Geology, Hydrogeology, Hydrology and Radon	Mapping provided by the British Geological Survey (Map. No. 247, Swansea, of the 1:50,000 series) does not show Made Ground deposits to be present at the site. However, given the development of the current school, it was considered likely to be present. The BGS geological map shows the eastern half of the site to be underlain by Head deposits, with the western half underlain by Glacial Till. Glacial Till Deposits are classified as Secondary Undifferentiated Aquifer by Natural Resources Wales (NRW). The solid geology underlying the site is the Brithdir Member which is designated a Secondary A Aquifer by NRW. A surface water drain extends along the sites eastern and northern boundary, flowing westwards through a culvert and emerging at the rear of residential properties to the east of the site as 'Cefn Season Dingle'. The site is located in an area why basic radon protection measures are required.
Fieldwork	• 6 No. Cable Percussive boreholes to 15m depth; • 4No. Variable head or BRE permeability tests (Attempted but not completed); • 8no. trial pits to 3.00m depth including soakaway and CBR testing; • 5no. windowless samples to 5.00m depth; • 6 no. ground gas and groundwater piezometer monitoring installations; • In situ testing including hand vane and standard penetration tests. • Groundwater level monitoring and sampling; • Ground gas monitoring on 3 no occasions; • Geotechnical and environmental laboratory sampling and testing of soil and water samples; and, • A factual and interpretive report of findings.
Ground Conditions Encountered	The sequence of strata encountered beneath the site comprised; • Topsoil; • Made Ground Deposits; • Glacial Deposits; and, • Brithdir Member.
Geotechnical Assessment	Shallow strip or pad foundations, founded on the coarse-grained Glacial Deposits, may be designed to an allowable net bearing pressure of 225kPa. This will give a factor of safety of greater than 3 against ultimate bearing capacity failure and should result in settlement of less than 25mm. Floor slabs may be ground bearing. A CBR value of 7% is recommended. Soakaway drainage is not deemed suitable for the site.
Ground contamination assessment	No contaminants of concern were identified within samples obtained from the re-worked Made Ground or Glacial Till deposits natural strata with respect to the risk to human health (current and future site users and construction workers). Asbestos was not identified in any samples obtained from the site. elevated heavy end TPH, PAH compounds and heavy metals recorded in a sample obtained from BH06 were likely associated with the mobilisation of contaminants in



	lubricants and greases used on casing joints arising from the recent drilling of the borehole. Minor elevated metal exceedances were also likely due to the mobilisation of ground due to the drilling, but also likely indicate a poor quality perched groundwater under the site, the metals exceeding the relevant screening criteria likely deriving from the reworked natural deposits beneath the site; no widespread anthropogenically derived inclusions were noted during the ground investigation which may give rise to these exceedances
Ground Gas Monitoring	Ground Gas monitoring undertaken to date has indicated slightly elevated concentrations of carbon dioxide within one borehole, as well as initially elevated concentrations of carbon monoxide and hydrogen sulphide. The gas screening value derived based on the data would indicate the site is a Characteristic Situation 1 site. However, CIRIA C665 guidance recommends that where concentrations of methane and carbon dioxide exceed 1% and 5% respectively, consideration should be given to elevating to Characterisation Situation 2. The classification of the site as a characteristic situation 2 is a preliminary indication only as the classification would normally be undertaken based on the results of several monitoring rounds during differing atmospheric pressure. It is recommended that a further three ground gas monitoring rounds are undertaken to be compliant with a CIRIA C665 risk assessment.



1.0 Introduction

1.1 Instruction

WYG Environment Planning Transport Ltd (WYG) was commissioned by Morgan Sindall Group to undertake intrusive ground investigation work to aid in the design of a new school on the site of a proposed school development in Cimla, Neath, on behalf of Neath Port Talbot Council.

1.2 Brief

The ground investigation is required to investigate the ground conditions for the proposed development of a new school on the existing school playing fields at Cefn Saeson Comprehensive School, Cimla.

The aim of this ground investigation is to provide information in regard to the geotechnical and geo-environmental properties of the ground.

The proposed scope of the ground investigation comprised the following:

- 6 No. Cable Percussive boreholes to 15m depth;
- 4No. Variable head or BRE permeability tests;
- 8no. trial pits to 3.00m depth including soakaway and CBR testing;
- 6no. windowless samples to 5.00m depth;
- 3 No. ground gas and groundwater monitoring installations;
- In situ testing including hand vane and standard penetration tests.
- Groundwater level monitoring and sampling;
- Ground gas monitoring;
- Geotechnical and environmental laboratory sampling and testing of soil and water samples;
- A factual and interpretive report of findings;
- Undertake extra ground gas and groundwater monitoring and sampling;
- Undertake extra sampling of top and sub soil from the area of the sports pitches, and;
- Re-evaluation of the environmental conclusions from the first report.



1.3 Report Scope

This report summarises the work undertaken and includes the following key elements:

- Full factual records of the site works carried out;
- Ground conditions encountered;
- In-situ test results;
- Geotechnical and chemical laboratory test results,
- Interpretation of in-situ, geotechnical and chemical testing results;
- A revisit to the site to undertaken sampling of top soils within the area of the rugby pitch;
- Re-sampling of groundwater from BH06 after purging, and
- Re-evaluation of the environmental conclusions in light of the extra-testing.

1.4 Limitations

This report has been prepared in accordance with the requirements of Morgan Sindall Group. It is subject to the report conditions contained in Appendix A.

The information contained in this report is intended for the use of Morgan Sindall Group. WYG can take no responsibility for the use of this information by any third party or for uses other than that described in this report.



2.0 Site Information

2.1 Location

The site is located in a field adjacent to Cefn Saeson Comprehensive School on Afan Valley Road, Castell-Nedd/Neath, SA11 3TA. The site is approximately 6 hectares (ha) in size and is centred on National Grid Reference (NGR) SS 773 960.

A site location plan is presented as Figure 1.

2.2 Site Description

The site currently consists of a comprehensive school with associated multi-level grassed areas used as sports pitches. A concrete tennis court and Multi Use Games Area (MUGA) are present in the northern portion of the site. In the south-western area of the site is an unused Redgra sports area, and a long jump and triple jump area with associated sand pits. An area of reeds is present to the north of the redgra sports area. The main access to the school is via Afan Valley Road adjacent to the junction of Afan Valley Road and Ridgewood Gardens. Access to the grassed areas is via a twin leaved metal gate approximately 75m to the south-east of the main school entrance, off the Afan Valley Road.

A site layout plan is included as Figure 2.

2.3 Geology

2.3.1 Made Ground

Mapping provided by the British Geological Survey (Map. No. 247, Swansea, of the 1:50,000 series) does not show Made Ground deposits to be present at the site. However, given the development of the current school, it is considered likely to be present.

2.3.2 Superficial Deposits

The BGS geological map shows the eastern half of the site to be underlain by Head deposits, with the western half underlain by Glacial Till. Head Deposits are described as comprising a gravel, sand and clay depending on the upslope source and the distance from the source. They are poorly sorted and poorly stratified, with local lenses of silt, clay or peat and organic material. They are essentially formed by solifluction and/or hillwash and soil creep.



Glacial Till comprises poorly sorted and poorly stratified silts, sands, gravels, cobbles and boulders in a dominant matrix of clay, formed from the action of glaciers during the most recent ice age.

2.3.3 Solid Geology

The solid geology underlying the site is identified as the Brithdir Member. This comprises green-grey lithic arenites with conglomerate lenses at bases of units. It can also contain thin mudstone/siltstone and seatearths interbedded with mainly thin coals. No coal seams are shown to crop out within 200m of the site (to the north, the Glyngwilym Coal), and no faults are within 250m of the site (to the west, the Gnoll Fault).

2.4 Hydrogeology

2.4.1 Aquifer Classification

The Glacial Till deposits are designated as a Secondary (Undifferentiated) aquifer by Natural Resources Wales (NRW). Secondary (Undifferentiated) aquifers are strata where it has not been possible to attribute either a Secondary A or Secondary B category to a rock type. The superficial aquifer is described as being of medium vulnerability to a pollutant discharged at ground level based on the hydrological, geological, hydrogeological and soil properties within a single square kilometre.

The Brithdir Member is designated a Secondary A aquifer by NRW. Secondary A aquifers are permeable strata capable of supporting water supplies at a local rather than strategic scale and in some cases forming an important source of base flow to rivers. The bedrock aquifer is described as being of medium vulnerability to a pollutant discharged at ground level based on the hydrological, geological, hydrogeological and soil properties within a single square kilometre.

2.4.2 Groundwater Source Protection Zones

There are no groundwater source protection zones (SPZ) shown to be present within 1km of the site.

2.4.3 Groundwater Vulnerability

The superficial deposits and Brithdir Member are both designated by NRW as 'Medium' risk aquifers. These *"are medium priority groundwater resource that have some natural protection resulting in an overall moderate groundwater risk."*¹

¹ New groundwater vulnerability mapping methodology in England and Wales. Environment Agency. SC040016/R.
www.wyg.com



2.5 Hydrology

A small approximately 1.50m deep channel follows the sites north-western and northern boundary, where it enters a culvert and continues to flow westwards. There are several drainage features on site, including a French drain around the north-western corner of the rugby pitches area. No other on-site drainage is noted.

2.6 Radon

The site is in a location where, according to BR211², basic radon protection measures are required.

2.7 Summary of Site History

Until the development of the site as a school, the site was open space, interpreted as pasture, with a small wooded area on the northern boundary of the site. The area around the site has been interpreted as pastoral also, until the development to the north, south and west of the site as residential. The area to the east has remained pastoral.

² Scivyer, C., 2015. Radon. Guidance on Protective Measures for New Buildings. Building Research Establishment. Bracknell.



3.0 Site Investigation

The site investigation was undertaken over a period between the 17th December 2018 to the 10th January 2018. Following completion of the initial site works, 3 no. return visits were made to site in order to undertake groundwater and ground gas monitoring.

Details of the fieldwork methods are given in the notes section at the end of this report.

3.1 Scope

The scope of the site investigation included the following:

- 6 No. Cable percussion boreholes with hand dug inspection pits to 1.2m bgl. (Depths ranging from 3.45m – 6.60m bgl);
- 8 No. Machine excavated trial pits to a maximum depth of 2.80m bgl;
- 5 no. Windowless samples to a maximum depth of 5.00m bgl;
- 6 no. In-situ California Bearing Ratio (CBR) and permeability testing was attempted (Soakaways plus falling head test within installations);
- Collection of disturbed and undisturbed soil samples from exploratory positions for environmental and geotechnical laboratory testing;
- Gas and groundwater monitoring installations within boreholes BH01, BH03, BH06, WS01, WS03, WS04 & WS05;
- 6 No. Return visits following the completion of fieldwork for the purpose of ground gas monitoring and groundwater level monitoring and sampling; and,
- A factual and interpretive report of findings.

Due to the findings from the first session of gas monitoring, and at the request of the Local Planning Authority, further ground gas and ground water monitoring was undertaken, as well as re-sampling groundwater from BH06. An extra visit was also scheduled to undertake top and sub-soil sampling from the area of the sports pitches.

Figure 2 shows the layout of the exploratory holes advanced during the site investigation. Exploratory hole logs including photographic plates are presented in Appendix B.

4.0 Ground Conditions Encountered

4.1 Strata Encountered

The sequence of strata encountered beneath the site comprised;

- Topsoil;
- Made Ground Deposits;
- Glacial Deposits; and,
- Brithdir Member

A summary of depth of each stratum is provided in Table 4-1 and descriptions of each stratum are detailed in the subsequent sections. Exploratory hole logs including photographic plates can also be seen in Appendix B.

Table 4-1 – Summary of strata depths (m bgl) for all exploratory holes

Location	Topsoil (m bgl)	Made Ground (m bgl)	Glacial Deposits (m bgl)	Brithdir Member (m bgl)
BH01	GL – 0.30	0.30 – 1.90	1.90 – 3.70 ⁺	ne
BH02	GL – 0.30	0.30 – 1.75	1.75 – 5.10	ne
BH03	ne	GL – 0.80	0.80 – 5.10 ⁺	5.10 – 5.50 ⁺
BH04	ne	GL – 1.00	1.00 – 3.45 ⁺	ne
BH05	ne	GL – 1.60	1.60 – 5.60 ⁺	ne
BH06	ne	GL – 1.20	1.20 – 6.30	6.30 – 6.60 ⁺
TP01	ne	GL – 2.20 ⁺	ne	ne
TP02	ne	GL – 0.70	0.70 – 2.80 ⁺	ne
TP03	ne	GL – 0.20	0.20 – 2.00	2.00 – 2.50 ⁺
TP04	ne	GL – 1.00	1.00 – 1.75	1.75 – 2.40 ⁺
TP05	ne	GL – 0.30	0.30 – 1.20	1.20 – 1.50 ⁺
TP06	ne	GL – 0.40	0.40 – 1.00	1.00 – 2.50 ⁺
TP07	ne	GL – 0.35	0.35 – 2.10 ⁺	Ne
TP08	ne	GL – 0.20	0.20 – 2.10	2.10 – 2.30 ⁺
WS01	ne	GL – 6.00 ⁺	ne	ne
WS02	ne	GL – 1.60 ⁺	ne	ne
WS03	ne	GL – 2.50	2.50 – 5.00 ⁺	ne

Location	Topsoil (m bgl)	Made Ground (m bgl)	Glacial Deposits (m bgl)	Brithdir Member (m bgl)
WS04	ne	GL – 1.40	1.40 – 3.45 ⁺	ne
WS05	ne	GL – 0.20	0.20 – 1.60 ⁺	ne
HP01`	0.0-0.2 (0.2-0.4)	ne	ne	ne
HP02`	0.0-0.3 (0.3-0.4)	ne	ne	ne
HP03`	0.0-0.3 (0.3-0.4)	ne	ne	ne

⁺ Base of stratum not proven

ne denotes not encountered

` These three locations are from the area of the sports pitches. The figures not in brackets indicate the depth of "topsoil" with the values in brackets denoting "sub-soil".

4.1.1 Topsoil

Topsoil comprising dark brown silty sandy CLAY was found in exploratory holes BH01 & BH02 only, to depths recorded in Table 1 above. Upon the second visit, top and sub soil was identified to a depth of 0.2-0.3 and 0.2-0.4m BGL respectively. Both top soil and subsoil were generally silty clayey sands with varying gravel content, the gravel being composed of sandstone. The difference between the top soil and subsoil was generally derived from colour, a brown as opposed to an orange brown respectively.

4.1.2 Made Ground

Made Ground in the form of reworked natural soils was found in all exploratory holes to depths recorded in Table 4-1.

Visual and olfactory evidence of contamination was not noted in the Made Ground deposits recorded across the site.

4.1.3 Glacial Deposits

Glacial deposits were encountered in most exploratory holes to depths recorded in Table 4-1.

Visual and olfactory evidence of contamination was not noted in the Glacial Deposits recorded across the site.

4.1.4 Solid Geology

The Brithdir Member deposits were encountered in seven of the exploratory holes to the depths recorded in Table 4-1. Please note, the full thickness of the Brithdir Member was not determined in any of the exploratory positions.

4.2 Groundwater Strikes

Groundwater strikes are recorded on the exploratory hole logs attached in Appendix B and are summarised in Table 4-2 below.

Table 4-2 – Groundwater Strikes

Location	Depth of groundwater strike (m bgl)	Stratum
BH01	3.70	Glacial Deposits
BH02	3.20	Glacial Deposits
BH03	4.20	Glacial Deposits
BH04	ne	ne
BH05	ne	ne
BH06	2.00	Glacial Deposits
BH06	2.00	Glacial Deposits
TP02	2.40	Glacial Deposits
TP03	2.40	Glacial Deposits
TP04	1.80	Glacial Deposits
TP05	1.50	Glacial Deposits
TP01`	ne	ne
TP02`	ne	ne
TP03`	ne	ne

Ne denotes not encountered

` These three locations are from the second visit to sample the soils from the area of sports pitches

4.3 Groundwater and Ground Gas Monitoring

4.3.1 Groundwater Level Monitoring

Groundwater level monitoring was undertaken on three visits subsequent to the site investigation between the 17th January and the 20th February 2019. Additional monitoring in the form of three further visits was undertaken between the 21st March 2019 and the 1st April 2019.

Groundwater levels recorded during the monitoring are summarised in Table 4-3, with full details provided in Appendix C.

Table 4-3 – Groundwater Level Monitoring Results during both phases of monitoring

Location	Minimum Groundwater Level (m BGL)	Maximum Groundwater Level (m BGL)	LNAPL	DNAPL
BH01	0.94	0.75	nd	nd
BH03	0.09	2.72	nd	nd
BH06	0.59	1.78	nd	nd
WS03	1.96	2.02	nd	nd
WS04	0.55	1.12	nd	nd
WS05	0.86	0.90	nd	nd

nd denotes not detected

4.3.2 Groundwater Sampling

After measurements of the water level and base of the installation were taken, samples were acquired from BH01, BH03, BH06 & WS04 on 30 January 2019, and of BH06 on the 26th March 2019; using a dedicated micro flow tubing and peristaltic pump.

A flow through cell was attached to the discharge tubing from the peristaltic pump and whilst purging, measurements of dissolved oxygen (DO), pH, temperature and electrical conductivity (EC) were taken using a water quality meter inserted into the flow through cell at approximate flow rates of 0.25 to 0.5 litres per second. Recordings of the field parameters were taken at 2-minute interval up to a maximum of 30 minutes.

The boreholes were considered purged when three consecutive readings of water quality meter within the following ranges:

- pH: ± 0.2 standard units;
- Dissolved Oxygen: $\pm 10\%$;
- Temperature: $\pm 1^{\circ}\text{C}$;
- Electrical Conductivity: $\pm 3\%$

Upon stabilisation of the water quality parameters, sampling was undertaken. During sample collection, relevant information such as notes of field observations were logged before carefully transferring the sample into laboratory supplied containers and stored in a cool box container which was kept cool throughout the day. Immediately prior to dispatch of the samples, fresh freezer packs were placed within the cool boxes and

the samples were forwarded to the laboratory for analysis.

Laboratory results from the groundwater samples are presented in Appendix C with a discussion on the sample results attached in Section 8.3.1.

4.3.3 Ground Gas Monitoring

Ground gas monitoring was undertaken on three visits subsequent to the site investigation between the 17th January and the 20th February 2019. Ground gas concentrations recorded over the monitoring period are presented below in Table 4-4 **Error! Reference source not found.**, with full details provided in Appendix C. A preliminary ground gas risk assessment is carried out in Section 9.

Table 4-4 – Ground Gas Monitoring Results

	Maximum Concentration (%)	Maximum Flow Rate (l/hr)
Carbon Dioxide	7.6	1.2
Methane	7.8	1.2

CS denotes Characteristic Situation

4.4 In Situ Testing

4.4.1 CBR Testing

6 No. California Bearing Tests (CBRs) were undertaken within trial pits. The results are presented within Appendix B.

4.4.2 Standard Penetration Testing

Standard Penetration Tests (SPTs) were undertaken in all boreholes and windowless samples. The results are presented on the exploratory hole logs included in Appendix B.

4.4.3 Super Heavy Dynamic Probe Testing

Super Heavy Dynamic Probes (SHDP) were undertaken at the base of two, WS01 & WS03 windowless samples. The results are presented on the exploratory hole logs included in Appendix B.

4.4.4 Visual Evidence of Contamination Encountered

No visual or olfactory evidence of contamination was encountered during the ground investigation.

4.5 Obstructions

Chiselling was required on several occasions in order to progress each of the boreholes. This information is



were recorded in the range of 8 to 36%, with a characteristic value of 125. This would indicate that the majority of soils at the site should achieve 95% compaction without pre-treatment or processing (Drying).

7.8 Drainage

Permeability testing was attempted at four locations (Soakaways) to assess drainage conditions in the ground, further permeability testing was attempted within borehole installations (Falling head), but due to the shallow groundwater table encountered testing could not be completed. Therefore, soakaways would not be a viable option.

Based on the above it is considered that soakaways will not be suitable in the ground and that surface water drainage should be connected to the piped drainage system in the area.

9.0 Preliminary Ground Gas Assessment

9.1 Introduction

Three rounds of ground gas monitoring have been undertaken on the site between the 17th January and the 20th February 2019, with a second phase of monitoring undertaken on the . Ground Gas readings were taken from six boreholes with installations. The following section provides a Ground Gas assessment based on the available data along with relevant recommendations with regard to Ground Gas.

A full factual record of the monitoring data is presented in Appendix C

9.2 Data Summary

The following provides a summary of the monitoring undertaken to date with the maximum vales (peak and steady) recorded at each monitoring location. The overall highest values across all boreholes are recorded in bold.

Table 9-1 - Summary of Maximum Recorded Ground Gas Concentrations

Location	Methane (CH ₄) (% vol)		Carbon Dioxide (CO ₂) (% vol)		Oxygen (O) (% vol)	CO (max ppm)	H ₂ S (max ppm)	Borehole flow
	Peak	Steady	Peak	Steady	Minimum	Max	Max	Peak
BH01	<0.1	<0.1	3.2	3.2	17.8	<1	<1	0.2
BH03	<0.1	<0.1	2.5	2.2	18.5	<1	<1	1.0
BH06	<0.1	<0.1	7.5	7.5	14.2	29	2	0.9
WS03	<0.1	<0.1	7.6	7.6	13.6	<1	<1	1.1
WS04	7.8	7.8	7.0	7.0	13.6	<1	<1	1.2
WS05	<0.1	<0.1	2.3	2.3	18.0	<1	<1	0.9

Monitoring visits were undertaken during a range of atmospheric pressure conditions including falling, rising and steady conditions. Onsite monitoring of atmospheric pressure also indicated atmospheric pressure conditions below 1000mbar, as such worst-case conditions have been considered during the monitoring period⁶.

⁶ Long term trends in atmospheric pressure reported on the monitoring sheets in Appendix F represent conditions at sea level.
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9.3 Ground Gas Risk Assessment Methodology

The key reference document which has been used to undertake the semi-quantitative Ground Gas assessment presented in this report is *CIRIA C665⁷ Assessing risks posed by hazardous Ground Gases to buildings*. This provides a framework for assessment of Ground Gas risk to buildings/structures with foundations (i.e. houses and/or commercial properties).

The collected data has been used for the purposes of undertaking a semi-quantitative assessment in accordance with CIRIA 665 methodology. The calculation used to calculate the gas screening value (GSV) for the site, together with the relevant definition of units, is as follows:

$$\begin{array}{ccccc} \text{GSV} & = & \text{borehole flow rate} & \times & \text{gas concentration} \\ \text{(litres of gas/hr)} & & \text{(litres per hour)} & & \text{(volume/100)} \end{array}$$

9.4 Preliminary Ground Gas risk assessment

Based on the maximal flow recorded of 0.4 l/h and the maximal concentrations of methane and carbon dioxide recorded during the initial three ground gas monitoring rounds, the following GSV have been calculated.

Table 9-2 – Initial GSV Calculations

Constituent	Maximum Concentration (%)	Maximum Flow Rate (L/hr)	GSV	Characteristic Situation
Methane (CH ₄)	7.8	1.2	0.0936	CS2*
Carbon Dioxide (CO ₂)	7.6	1.2	0.0912	CS2*

These values have been compared with the Revised Wilson and Card Classification presented within the CIRIA C665 (2007) report, specifically Table 8.5. The Characteristic values presented above reflect a risk assessment designed for the majority of building types with the exception of low-rise residential buildings which are covered by the NHBC Traffic light system.

One significantly elevated methane was detected during the monitoring visits, and was associated with a flow rate of 1.2 L/hr. There is no obvious source for this methane; given the ground conditions it is unlikely to be sourced from the landfill to the south-east of the site, nor from worked or unworked coal seams beneath the site.

⁷ Wilson, S., Oliver, S., Mallett H., Hutchings, H., Card G., 2007. *Assessing Risks Posed by Hazardous Ground Gases to Buildings*. CIRIA C665. London.
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One potential provenance of the methane is from the decomposition of coal and/or organic matter within the Made Ground, which accumulates and migrates slowly, dependent on the prevalent atmospheric and ground conditions.

Another, albeit limited, is from the culverted stream to the north of this location; organic material entrapped within the culvert could decay giving rise to methane, but this would also require a suitably positioned pathway, which is considered unlikely.

As calculations for both methane and carbon dioxide result in a Characteristic Situation 2, this one elevated result would not change the overall classification.

9.5 Radon

BRE211² indicates the site to be in an area where basic radon protection measures are required.

9.6 Summary and Discussion

Based on the risk assessment presented above, the site is considered to be representative of Characteristic Situation 2 (Low Risk). Carbon dioxide gas readings above 5% by volume indicates that this area should be classified as Characteristic Situation 2 (Low Risk) in line with CIRIA 665 guidance.

One significantly elevated methane was detected during the monitoring visits, and was associated with a flow rate of 1.2 L/hr. There is no obvious source for this methane; given the ground conditions it is unlikely to be sourced from the landfill to the south-east of the site, nor from worked or unworked coal seams beneath the site.

One potential provenance of the methane is from the decomposition of coal and/or organic matter within the Made Ground, which accumulates and migrates slowly, dependent on the prevalent atmospheric and ground conditions.

Another, albeit limited, is from the culverted stream to the north of this location; organic material entrapped within the culvert could decay giving rise to methane, but this would also require a suitably positioned pathway, which is considered unlikely.

As calculations for both methane and carbon dioxide result in a Characteristic Situation 2, this one elevated result would not change the overall classification.



A site classification of a Characteristic Situation 2 indicates a requirement for basic level gas protection measures. Such measures are prescribed in BS8485:2015 and are based on gas protection scores generated using a combination of the CS categorisation and the type of building within the proposed development. Once a score is generated, it can be used to prescribe a method for the installation of gas protection measures, which in part is developed with the type of building and foundation solution utilised at the site. Therefore, a suitably qualified land gas protection specialist should be consulted during the detailed design stage in order that appropriate land gas protection measures can be specified and installed at the site.



10.0 Site Conceptual Model and Ground Contamination Risk Assessment

10.1 Introduction

In general, ground contamination can occur through several causes, particularly from historical operations and activities. The contamination can result from either on-site sources or from on-site migration from off-site sources, leading to long term liabilities under recent legislation for any site owner.

The Environmental Protection Act 1990 (Part 2A) makes provisions for a risk-based framework for the identification, assessment, management and redevelopment of contaminated land within the UK. The provisions of the Act came into effect in Wales in July 2001 and are aimed at ensuring that actions taken with respect to contaminated land are directed by a technically well-founded assessment of risk.

The process of risk assessment is an evaluation of the probability of harm, and comprises the identification of sources of contamination, receptors that may be affected by the contamination and pathways by which the receptors may be harmed forming a pollution linkage.

The site conceptual model (presented below) forms the basis for the qualitative assessment of ground contamination risks associated with the site.

10.2 Site conceptual model

The site conceptual model for the site reflects the findings and observations during the site investigation. The key source, pathway, receptor model is outlined below within the context of the proposed development of the site as comprehensive.

10.2.1 Sources

The following sources of contamination have been identified on site:

- Ground Gases (carbon dioxide, hydrogen sulphide, and carbon monoxide) likely derived from the degradation organic content present within the re-worked Made Ground and Glacial Till deposits;
- The presence of Radon, and;
- Elevated concentrations of inorganic and organic contaminant concentrations in groundwater.



10.2.2 Pathways

The primary pathways by which sensitive receptors may come into contact with ground contamination are considered to be the following:

- Leaching and horizontal or vertical migration through the unsaturated ground, either through permeable sub-surface materials and/or preferential pathways;
- Leaching and lateral/vertical migration of groundwater through permeable sub-surface materials and/or preferential pathways, and;
- Migration and accumulation of gases or vapours through permeable sub-surface materials and/or preferential pathways.

10.2.3 Potential receptors

The following are considered to be sensitive receptors:

- Current site users (informal area of open ground);
- Site construction workers;
- Future site users;
- Future proposed site infrastructure;
- Surface waters (unnamed ditches along the eastern and northern boundaries); and,
- Groundwater (Secondary A Aquifers)

10.3 Ground contamination risk assessment table

The pollution linkages and a qualitative risk assessment are presented in Table 10-1 below. The risk assessment considers the site within an area context and assesses potential risks to identified receptors in relation to the existing site setting and the proposed development. CIRIA C552 has been used to define the risk rating presented in the Qualitative Risk Assessment matrix, methodology for which is presented in Appendix F.



Table 10-1 - CIRIA C552 Qualitative Risk Assessment

Source	Pathway	Receptor	Consequence of risk being realised	Probability of risk being realised	Risk Classification	Potential risk management requirements
Ground Gases (carbon dioxide, hydrogen sulphide and carbon monoxide) likely derived from degradation of organic content present in the re-worked Made Ground and Glacial Till deposits.	Migration and accumulation of gases or vapours through permeable sub-surface materials and/or preferential pathways	Current site users (informal area of open ground)	Medium	Unlikely	Low Risk	Carbon dioxide, carbon monoxide and hydrogen sulphide have been detected at concentrations above the limit of detection. Carbon dioxide was detected at a maximum concentration of 6.4 % vol/vol. The area investigated is currently utilised for recreation purposes with no enclosed space and therefore, any users of the site would face a negligible risk.
		Site construction workers	Medium	Unlikely	Low Risk	Given the detectable concentrations and flow rates, it would be sufficient to monitor the base of any excavations prior to entry to detect the concentrations of gas.
		Future site users	Medium	Unlikely	Low Risk	Carbon dioxide, methane, carbon monoxide and hydrogen sulphide have been detected. Concentrations of carbon monoxide and hydrogen sulphide decreased to the limit of detection of the device (0.1ppm), and flow was minimal (max 0.4 L/hr). Carbon dioxide was detected at a maximum concentration of 6.4 % vol/vol. Methane was detected in one location on one monitoring visit



Source	Pathway	Receptor	Consequence of risk being realised	Probability of risk being realised	Risk Classification	Potential risk management requirements
The presence of Radon		Future proposed site infrastructure	Medium		Low Risk (CIRIA C552 Risk Rating – 'Low Risk')	and is not considered indicative of methane below the site. Radon protection measures are required for any new development at the site. Based on the results from the ground gas monitoring it is considered that the site is representative of a Characteristic Situation 2 (Low Risk).
	Migration and accumulation of Radon through permeable sub-surface materials and/or preferential pathways	Current site users (informal area of open ground)	Medium	Unlikely	Low Risk	Exposure to radon of casual users is likely to be limited as a result of the dilutive effect of the atmosphere, and exposure is considered to be practically zero.
		Site construction workers	Medium	Unlikely	Low Risk	Exposure to radon of site construction workers is likely to be limited to the dilutive effect of the atmosphere, and exposure is considered to be practically zero.
		Future site users	Medium	Unlikely	Low Risk	This classification of risk is given provided that radon protection measures are implemented. These should prevent radon from accumulating in enclosed areas.



Source	Pathway	Receptor	Consequence of risk being realised	Probability of risk being realised	Risk Classification	Potential risk management requirements
Elevated concentrations of heavy metals, heavy end TPH and PAH compounds in groundwater	Leaching and horizontal or vertical migration through the unsaturated ground, either through permeable sub-surface materials and/or preferential pathways	Surface waters	Medium	Unlikely	Low Risk	Elevated Poly Aromatic Hydrocarbon (PAH) and TPH compounds were detected in earlier monitoring rounds. One second round of sampling showed a significant decrease in concentrations of both. It was hypothesised that the presence of these was due to lubricants from the drilling process being entrapped within the borehole. The second phase of monitoring with the significantly decreased concentrations has indicated that this is likely to have been the case. Some metal exceedance have been detected but these are considered to be likely due to the poor quality of the perched groundwater due to the leaching of metals from the reworked natural ground which underlies the majority of the site.
		Groundwater (Secondary A)	Medium	Unlikely	Low Risk	

11.0 Conclusions and Recommendations

11.1 Conclusions

No contaminants of concern were identified within samples obtained from the re-worked Made Ground and Glacial Till deposits natural strata with respect to the risk to human health (current and future site users and construction workers).

Asbestos was not identified in any samples obtained from the site.

The elevated heavy end TPH, PAH compounds and heavy metals recorded in a sample obtained from BH06 were likely associated with the mobilisation of contaminants in lubricants and greases used on casing joints arising from the recent drilling of the borehole. Minor elevated metal exceedances were also likely due to the mobilisation of ground due to the drilling, but also likely indicate a poor quality perched groundwater under the site, the metals exceeding the relevant screening criteria likely deriving from the reworked natural deposits beneath the site; no widespread anthropogenically derived inclusions were noted during the ground investigation which may give rise to these exceedances.

Ground Gas monitoring undertaken to date has indicated elevated concentrations of carbon dioxide and methane within one borehole, as well as initially carbon monoxide and hydrogen sulphide. The gas screening value derived based on the data would indicate the site is a Characteristic Situation 2 site for both carbon monoxide and methane.

The Landfill Directive places rigorous controls on waste disposal. These controls include requirements to follow the waste acceptance procedures and criteria that have been agreed by the Council of the European Union and are laid out in Council Decision 2003/33/EC.

Before a waste can be accepted at a landfill site, the landfill operator must be satisfied that the waste meets the specified permit conditions, the waste acceptance procedures (WAP) and waste acceptance criteria (WAC). Therefore, it is the responsibility of the contractor, as waste producer, to classify the waste and to identify a suitable waste disposal facility based on the chemical composition of the material. To ensure the suitability of the material for the licensed waste facility, waste acceptance criteria testing must be undertaken, with the results forwarded to the chosen licensed facility.

11.2 Recommendations

The following recommendations are presented in the context of the construction of the proposed school development:



- Liaison with the regulatory authority is recommended with regards to the potential need for further ground gas monitoring at the site;
- It is recommended that further groundwater sampling is undertaken at the site following the purging of three well volumes of all groundwater monitoring installations. The findings of the sampling should be used to revise the ground contamination assessment;



Figures



Figure 1 – Site Location Plan

DO NOT SCALE: CONTRACTOR TO CHECK ALL DIMENSIONS AND
REPORT ANY OMISSIONS OR ERRORS



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Client:
**MORGAN SINDALL CONSTRUCTION
& INFRASTRUCTURE**

Project:
CEFN SAESON, CIMLA

Drawing Title:
SITE LOCATION PLAN

REV	DESCRIPTION	BY	CHK	APP	DATE
1					

Scale	Drawn	Date	Checked	Date	Approved	Date
A110444	CDF	N		1		00



Appendix C – Groundwater & Ground Gas Results

WYG Environmental Planning and Transport

LANDGAS AND GROUNDWATER MONITORING RESULTS

5th Floor, Longcross Court, 47 Newport Road, Cardiff, CF24 0AD



Site Name: Cefn Saeson
Job No.: A111968
Client: Morgan Sindall

Date Monitored: 17/01/19
Monitoring Engineer: JM
Weather:

Clear

EQUIPMENT USED											
Type	Make		Serial				Last Calibrated				
Gas Analyser	Landtec GA5000		G502044				Mar-18				
Interface Meter	Solinst		122-004988-1				n/a				
LANDGAS CONCENTRATIONS - INSTALLATION CONDITIONS											
Exploratory Hole No	Peak		Steady								
	CH ₄ (% vol)	CO ₂ (% vol)	CH ₄ (% vol)	CO ₂ (% vol)	O ₂ (% vol)	BAL (%)	PID (ppm)	H ₂ S (ppm)	HCN (ppm)	CO (ppm)	Time to stabilise (s)
BH01	<0.1	1.8	<0.1	1.6	19.9	77.5	nt	<1	nt	<1	60
BH03	<0.1	2.5	<0.1	2.3	18.5	77.1	nt	<1	nt	<1	60
BH06	<0.1	2.2	<0.1	2.1	20.7	77.2	nt	2	nt	29	60
WS03	<0.1	5.3	<0.1	5.2	18.3	76.5	nt	<1	nt	<1	60
WS04	<0.1	1.9	<0.1	1.1	22.7	76.2	nt	<1	nt	<1	60
WS05	<0.1	2.3	<0.1	2.0	18.0	79.7	nt	<1	nt	<1	60
LANDGAS - PHYSICAL PARAMETERS											
Exploratory Hole No	Atmos Pressure (m bar)	Atmos Temp (°C)	BH Flow		BH Pressure		Remarks				
			Peak (L/hr)	Steady (L/hr)	Peak (mbar)	Steady (mbar)					
BH01	1008	3.0	0.2	0.1	0.2	0.1					
BH03	1008	3.0	0.3	-0.1	0.3	0.2					
BH06	1008	3.0	-0.4	-0.2	0.1	0.0					
WS03	1008	3.0	-0.1	0.0	0.0	0.0					
WS04	1008	3.0	-0.2	0.1	-0.2	-0.1					
WS05	1008	3.0	0.1	0.0	-0.1	-0.1					
AMBIENT ATMOSPHERIC CONDITIONS						ATMOSPHERIC PRESSURE CONDITIONS					
Parameter		Before Monitoring		After Monitoring							
CH ₄ (% vol)		<0.1		<0.1		3 days prior (m bar)			1024		
CO ₂ (% vol)		0.1		0.1		2 days prior (m bar)			1020		
O ₂ (% vol)		21.7		21.7		1 day prior (m bar)			1004		
PID (ppm)		nt		nt		during (m bar) am,midday,pm			1004, 1015, 1019		
Atmos Press. (m bar)		1008		1008		1 day post (m bar)			1012		
GROUNDWATER / NAPL - PHYSIO-CHEMICAL PARAMETERS											
Exploratory Hole No	Water Surface (mbgl)	Base Depth (mbgl)	LNAPL Surface (mbgl)	DNAPL Surface (mbgl)	Water Quality Indicators						Remarks
					ORP (mV)	SPC (µs/cm)	C (µs/cm)	Ph (value)	DO (mg/L)	Temp (°C)	
BH01	0.77	3.59	nd	nd	nt	nt	nt	nt	nt	nt	
BH03	0.84	5.49	nd	nd	nt	nt	nt	nt	nt	nt	
BH06	0.59	5.60	nd	nd	nt	nt	nt	nt	nt	nt	
WS03	DRY	0.98	nd	nd	nt	nt	nt	nt	nt	nt	
WS04	0.66	2.08	nd	nd	nt	nt	nt	nt	nt	nt	
WS05	DRY	0.99	nd	nd	nt	nt	nt	nt	nt	nt	

Notes

nt = not tested
nd = not detected

Data Compiled by: JM
Data Checked by: JP

WYG Environmental Planning and Transport

LANDGAS AND GROUNDWATER MONITORING RESULTS

5th Floor, Longcross Court, 47 Newport Road, Cardiff, CF24 0AD



Site Name: Cefn Saeson
Job No.: A111968
Client: Morgan Sindall

Date Monitored: 30/01/19
Monitoring Engineer: JD
Weather: Clear, Cold

EQUIPMENT USED											
Type	Make		Serial			Last Calibrated					
Gas Analyser	Landtec GA5000		G502044			Mar-18					
Interface Meter	Solinst		122-004988-1			n/a					
LANDGAS CONCENTRATIONS - INSTALLATION CONDITIONS											
Exploratory Hole No	Peak		Steady								
	CH ₄ (% vol)	CO ₂ (% vol)	CH ₄ (% vol)	CO ₂ (% vol)	O ₂ (% vol)	BAL (%)	PID (ppm)	H ₂ S (ppm)	HCN (ppm)	CO (ppm)	Time
BH01	<0.1	3.2	<0.1	3.2	19.1	77.7	nt	<1	nt	<1	11:58:00
BH03	<0.1	2.3	<0.1	2.2	19.3	78.5	nt	<1	nt	<1	11:15:00
BH06	<0.1	1.3	<0.1	1.3	20.6	78.1	nt	<1	nt	<1	13:53:00
WS03	<0.1	4.9	<0.1	4.9	17.5	77.6	nt	<1	nt	<1	12:42:00
WS04	<0.1	0.8	<0.1	0.5	21.5	78	nt	<1	nt	<1	13:13:00
WS05	<0.1	1.8	<0.1	1.5	20.8	77.7	nt	<1	nt	<1	10:49:00
LANDGAS - PHYSICAL PARAMETERS											
Exploratory Hole No	Atmos Pressure (m bar)	Atmos Temp (°C)	BH Flow		BH Pressure		Remarks				
			Peak (L/hr)	Steady (L/hr)	Peak (mbar)	Steady (mbar)					
BH01	977	nt	0.0	0.0	0.2	0.2					
BH03	977	nt	0.3	0.3	-3.7	-2.9					
BH06	977	nt	0.2	0.2	0.0	0.0					
WS03	977	nt	0.4	0.4	1.1	1.0					
WS04	977	nt	0.3	0.3	0.0	0.0					
WS05	977	nt	0.0	0.0	0.3	0.3					
AMBIENT ATMOSPHERIC CONDITIONS						ATMOSPHERIC PRESSURE CONDITIONS					
Parameter		Before Monitoring		After Monitoring							
CH ₄ (% vol)		<0.1		<0.1		3 days prior (m bar)			1003		
CO ₂ (% vol)		0.1		0.1		2 days prior (m bar)			1012		
O ₂ (% vol)		21.6		21.6		1 day prior (m bar)			996		
PID (ppm)		nt		nt		during (m bar) am,midday,pm			,977		
Atmos Press. (m bar)		977		977		1 day post (m bar)			984		
GROUNDWATER / NAPL - PHYSIO-CHEMICAL PARAMETERS											
Exploratory Hole No	Water Surface (mbgl)	Base Depth (mbgl)	LNAPL Surface (mbgl)	DNAPL Surface (mbgl)	Water Quality Indicators						Remarks
					ORP (mV)	SPC (µs/cm)	C (µs/cm)	Ph (value)	DO (mg/L)	Temp (°C)	
BH01	0.75	5.69	nt	nt	-32.7	527.1	369.2	7.1	nt	9.0	
BH03	2.31	5.42	nt	nt	-96.8	538.6	380.4	7.3	nt	9.6	
BH06	1.68	3.45	nt	nt	52.6	642.1	460.2	6.9	nt	9.6	
WS03	1.99	2.05	nt	nt	nt	nt	nt	nt	nt	nt	
WS04	0.55	1.10	nt	nt	-6.2	393.7	261.6	7.2	nt	7.7	
WS05	dry	0.99	nt	nt	nt	nt	nt	nt	nt	nt	

Notes

nt = not tested
nd = not detected

Data Compiled by: JD

Data Checked by:

WYG Environmental Planning and Transport

LANDGAS AND GROUNDWATER MONITORING RESULTS

5th Floor, Longcross Court, 47 Newport Road, Cardiff, CF24 0AD



Site Name: Cefn Saeson
Job No.: A111968
Client: Morgan Sindall

Date Monitored: 20/02/2019
Monitoring Engineer: SB
Weather: Wet and windy

EQUIPMENT USED											
Type	Make		Serial				Last Calibrated				
Gas Analyser	Landtec GA5000		G502044				Mar-18				
Dip Meter	Solinst		-				n/a				
LANDGAS CONCENTRATIONS - INSTALLATION CONDITIONS											
Exploratory Hole No	Peak		Steady								
	CH ₄ (% vol)	CO ₂ (% vol)	CH ₄ (% vol)	CO ₂ (% vol)	O ₂ (% vol)	BAL (%)	PID (ppm)	H ₂ S (ppm)	HCN (ppm)	CO (ppm)	Time
BH01	<0.1	2.4	<0.1	2.4	18.6	78.9	nt	<1	nt	<1	13:15:00
BH03	<0.1	0.9	<0.1	0.2	21.6	78.1	nt	<1	nt	<1	13:36:00
BH06	<0.1	1.9	<0.1	1.9	19.0	79	nt	<1	nt	<1	14:00:00
WS03	<0.1	6.4	<0.1	6.4	15.2	78.3	nt	<1	nt	<1	12:40:00
WS04	<0.1	0.1	<0.1	0.1	21.6	78.3	nt	<1	nt	<1	12:54:00
WS05	<0.1	0.5	<0.1	0.4	21.2	78.4	nt	<1	nt	<1	13:48:00
LANDGAS - PHYSICAL PARAMETERS											
Exploratory Hole No	Atmos Pressure (m bar)	Atmos Temp (°C)	BH Flow		BH Pressure		Remarks				
			Peak (L/hr)	Steady (L/hr)	Peak (mbar)	Steady (mbar)					
BH01	999	nt	-12.80	-7.80	-7.65	-6.90					
BH03	1000	nt	-0.20	-0.20	-0.03	-0.03					
BH06	1000	nt	0.10	0.10	-2.93	-2.93					
WS03	1001	nt	0.00	0.00	0.01	0.01					
WS04	1001	nt	0.00	0.00	0.05	0.05					
WS05	1000	nt	0.10	0.10	0.02	0.02					
AMBIENT ATMOSPHERIC CONDITIONS						ATMOSPHERIC PRESSURE CONDITIONS					
Parameter		Before Monitoring		After Monitoring							
CH ₄ (% vol)		0.1		0.0		3 days prior (m bar)			1013		
CO ₂ (% vol)		0.1		0.1		2 days prior (m bar)			1015		
O ₂ (% vol)		21.1		21.7		1 day prior (m bar)			1019		
PID (ppm)		nt		nt		during (m bar) am,midday,pm			1019		
Atmos Press. (m bar)		1001		1000		1 day post (m bar)					
GROUNDWATER / NAPL - PHYSIO-CHEMICAL PARAMETERS											
Exploratory Hole No	Water Surface (mbgl)	Base Depth (mbgl)	LNAPL Surface (mbgl)	DNAPL Surface (mbgl)	Water Quality Indicators						Remarks
					ORP (mV)	SPC (µs/cm)	C (µs/cm)	Ph (value)	DO (mg/L)	Temp (°C)	
BH01	0.87	5.70	nd	nd	nt	nt	nt	nt	nt	nt	-
BH03	2.49	5.42	nd	nd	nt	nt	nt	nt	nt	nt	-
BH06	1.78	3.45	nd	nd	nt	nt	nt	nt	nt	nt	-
WS03	1.99	2.09	nd	nd	nt	nt	nt	nt	nt	nt	-
WS04	1.12	1.13	nd	nd	nt	nt	nt	nt	nt	nt	-
WS05	0.86	0.97	nd	nd	nt	nt	nt	nt	nt	nt	-

Notes

nt = not tested
nd = not detected

Data Compiled by: SB
Data Checked by: JP

WYG Environmental Planning and Transport

LANDGAS AND GROUNDWATER MONITORING RESULTS

5th Floor, Longcross Court, 47 Newport Road, Cardiff, CF24 0AD



Site Name: Cefn Saeson
Job No.: A111968
Client: Morgan Sindall

Date Monitored: 21/03/2019
Monitoring Engineer: JP
Weather: Misty, damp

EQUIPMENT USED											
Type	Make		Serial				Last Calibrated				
Gas Analyser	Landtec GA5000		G502044				Mar-18				
Dip Meter	Solinst		-				n/a				
LANDGAS CONCENTRATIONS - INSTALLATION CONDITIONS											
Exploratory Hole No	Peak		Steady								
	CH ₄ (% vol)	CO ₂ (% vol)	CH ₄ (% vol)	CO ₂ (% vol)	O ₂ (% vol)	BAL (%)	PID (ppm)	H ₂ S (ppm)	HCN (ppm)	CO (ppm)	Time
BH01	0.0	3.1	0.0	3.1	17.8	79.1	nt	0	nt	0	10:09
BH03	0.0	0.2	0.0	0.2	22.3	77.5	nt	0	nt	0	10:47
BH06	0.0	2.0	0.0	2.0	19.7	78.3	nt	0	nt	0	11:09
WS03	0.0	7.1	0.0	7.1	13.6	79.3	nt	0	nt	0	09:58
WS04	0.0	0.9	0.0	0.7	21.4	77.5	nt	0	nt	0	09:35
WS05	0.0	0.8	0.0	0.8	21.7	77.4	nt	0	nt	0	10:56
LANDGAS - PHYSICAL PARAMETERS											
Exploratory Hole No	Atmos Pressure (m bar)	Atmos Temp (°C)	BH Flow		BH Pressure		Remarks				
			Peak (L/hr)	Steady (L/hr)	Peak (mbar)	Steady (mbar)					
BH01	1016	nt	-8.70	-8.70	0.05	0.05	Atmos. Temp. was 8°C at the start of monitoring and was at 9°C at the completion of monitoring according to the in-car thermometer				
BH03	1016	nt	0.30	0.30	0.15	0.15					
BH06	1017	nt	0.20	0.20	0	0					
WS03	1016	nt	0.40	0.40	0.02	-0.02					
WS04	1016	nt	0.30	0.30	0.50	0.50					
WS05	1017	nt	0.30	0.30	0.02	0.02					
AMBIENT ATMOSPHERIC CONDITIONS						ATMOSPHERIC PRESSURE CONDITIONS					
Parameter		Before Monitoring		After Monitoring							
CH ₄ (% vol)		0.0		0.0		3 days prior (m bar)			1023		
CO ₂ (% vol)		0.0		0.0		2 days prior (m bar)			1028		
O ₂ (% vol)		22.1		22.2		1 day prior (m bar)			1033		
PID (ppm)		nt		nt		during (m bar) am,midday,pm			1034		
Atmos Press. (m bar)		1016		1017		1 day post (m bar)			1029		
GROUNDWATER / NAPL - PHYSIO-CHEMICAL PARAMETERS											
Exploratory Hole No	Water Surface (mbgl)	Base Depth (mbgl)	LNAPL Surface (mbgl)	DNAPL Surface (mbgl)	Water Quality Indicators						Remarks
					ORP (mV)	SPC (µs/cm)	C (µs/cm)	Ph (value)	DO (mg/L)	Temp (°C)	
BH01	0.78	5.67	nd	nd	nt	nt	nt	nt	nt	nt	
BH03	0.09	5.45	nd	nd	nt	nt	nt	nt	nt	nt	
BH06	1.71	3.46	nd	nd	nt	nt	nt	nt	nt	nt	
WS03	2.02	2.10	nd	nd	nt	nt	nt	nt	nt	nt	
WS04	0.65	1.14	nd	nd	nt	nt	nt	nt	nt	nt	
WS05	0.90	0.97	nd	nd	nt	nt	nt	nt	nt	nt	

Notes

nt = not tested
nd = not detected

Data Compiled by: SB
Data Checked by: JP

WYG Environmental Planning and Transport

LANDGAS AND GROUNDWATER MONITORING RESULTS

5th Floor, Longcross Court, 47 Newport Road, Cardiff, CF24 0AD



Site Name: Cefn Saeson
Job No.: A111968
Client: Morgan Sindall

Date Monitored: 26/03/2019
Monitoring Engineer: JD
Weather: Clear, Mild

EQUIPMENT USED											
Type	Make			Serial				Last Calibrated			
Gas Analyser	Landtec GA5000			G502044				Mar-18			
Dip Meter	Solinst			-				n/a			
LANDGAS CONCENTRATIONS - INSTALLATION CONDITIONS											
Exploratory Hole No	Peak		Steady								
	CH ₄ (% vol)	CO ₂ (% vol)	CH ₄ (% vol)	CO ₂ (% vol)	O ₂ (% vol)	BAL (%)	PID (ppm)	H ₂ S (ppm)	HCN (ppm)	CO (ppm)	Time
BH01	0.0	0.6	0.0	0.6	20.3	79.1	nt	0	nt	0	10:31
BH03	0.0	0.2	0.0	0.2	21.2	78.7	nt	0	nt	0	10:04
BH06	0.0	7.5	0.0	7.5	14.2	78.3	nt	0	nt	0	11:31
WS03	0.0	2.3	0.0	2.3	19.0	78.6	nt	0	nt	0	11:17
WS04	0.0	1.0	0.0	0.6	20.8	78.7	nt	0	nt	0	10:52
WS05	0.0	1.5	0.0	1.3	21.0	77.7	nt	0	nt	0	09:49
LANDGAS - PHYSICAL PARAMETERS											
Exploratory Hole No	Atmos Pressure (m bar)	Atmos Temp (°C)	BH Flow		BH Pressure		Remarks				
			Peak (L/hr)	Steady (L/hr)	Peak (mbar)	Steady (mbar)					
BH01	1016	10.0	-4.20	-4.20	-0.31	-0.31					
BH03	1016	10	0.30	0.30	-0.10	-0.10					
BH06	1017	11	0.2	0.2	0.02	0.02					
WS03	1018	10	0.30	0.30	-0.09	-0.09					
WS04	1018	9	0.30	0.30	0.55	0.55					
WS05	1015	9	0.20	0.20	0.10	0.10					
AMBIENT ATMOSPHERIC CONDITIONS						ATMOSPHERIC PRESSURE CONDITIONS					
Parameter		Before Monitoring		After Monitoring							
CH ₄ (% vol)		0.0		0.0		3 days prior (m bar)			1014		
CO ₂ (% vol)		0.3		0.3		2 days prior (m bar)			1015		
O ₂ (% vol)		22.6		22.6		1 day prior (m bar)			1015		
PID (ppm)		nt		nt		during (m bar) am,midday,pm			1015, 1017, 1018		
Atmos Press. (m bar)		1015		1017		1 day post (m bar)			1017		
GROUNDWATER / NAPL - PHYSIO-CHEMICAL PARAMETERS											
Exploratory Hole No	Water Surface (mbgl)	Base Depth (mbgl)	LNAPL Surface (mbgl)	DNAPL Surface (mbgl)	Water Quality Indicators						Remarks
					ORP (mV)	SPC (µs/cm)	C (µs/cm)	Ph (value)	DO (mg/L)	Temp (°C)	
BH01	0.86	5.60	nt	nt	nt	nt	nt	nt	nt	nt	
BH03	2.58	5.38	nt	nt	nt	nt	nt	nt	nt	nt	
BH06	1.77	3.35	nt	nt	238.9	800.5	595.1	8.6	2.8	11.6	
WS03	1.98	2.03	nt	nt	nt	nt	nt	nt	nt	nt	
WS04	Dry	1.08	nt	nt	nt	nt	nt	nt	nt	nt	
WS05	0.86	0.94	nt	nt	nt	nt	nt	nt	nt	nt	

Notes

nt = not tested
nd = not detected

Data Compiled by: JD
Data Checked by: JP

WYG Environmental Planning and Transport

LANDGAS AND GROUNDWATER MONITORING RESULTS

5th Floor, Longcross Court, 47 Newport Road, Cardiff, CF24 0AD



Site Name: Cefn Saeson
Job No.: A111968
Client: Morgan Sindall

Date Monitored: 01/04/2019
Monitoring Engineer: JP
Weather: Clear, cool, strong breeze

EQUIPMENT USED											
Type	Make			Serial				Last Calibrated			
Gas Analyser	Landtec GA5000			G502044				Mar-18			
Dip Meter	Solinst			-				n/a			
LANDGAS CONCENTRATIONS - INSTALLATION CONDITIONS											
Exploratory Hole No	Peak		Steady								
	CH ₄ (% vol)	CO ₂ (% vol)	CH ₄ (% vol)	CO ₂ (% vol)	O ₂ (% vol)	BAL (%)	PID (ppm)	H ₂ S (ppm)	HCN (ppm)	CO (ppm)	Time
BH01	0.0	0.9	0.0	0.7	20.7	78.4	nt	0	nt	0	10:12
BH03	0.0	0.1	0.0	0.1	21.6	78.3	nt	0	nt	0	09:45
BH06	0.0	2.8	0.0	2.7	20.0	77.8	nt	0	nt	0	11:02
WS03	0.0	7.6	0.0	7.6	15.0	77.4	nt	0	nt	0	10:55
WS04	7.8	7.0	6.7	6.4	13.6	65.8	nt	0	nt	0	10:34
WS05	0.0	0.9	0.0	0.9	21.1	78.1	nt	0	nt	0	09:30
LANDGAS - PHYSICAL PARAMETERS											
Exploratory Hole No	Atmos Pressure (m bar)	Atmos Temp (°C)	BH Flow		BH Pressure		Remarks				
			Peak (L/hr)	Steady (L/hr)	Peak (mbar)	Steady (mbar)					
BH01	1003	nt	-3.20	-3.20	-0.20	-0.20					
BH03	1004	nt	1.00	1.00	0.07	0.07					
BH06	1006	nt	0.9	0.9	0.03	0.03					
WS03	1003	nt	1.10	1.10	0.04	0.03					
WS04	1003	nt	1.20	1.20	0.02	0.02					
WS05	1005	nt	0.90	0.90	0.03	0.03					
AMBIENT ATMOSPHERIC CONDITIONS						ATMOSPHERIC PRESSURE CONDITIONS					
Parameter		Before Monitoring		After Monitoring							
CH ₄ (% vol)		0.0		0.0		3 days prior (m bar)			1014		
CO ₂ (% vol)		0.3		0.3		2 days prior (m bar)			1015		
O ₂ (% vol)		22.6		22.6		1 day prior (m bar)			1015		
PID (ppm)		nt		nt		during (m bar) am,midday,pm			1015, 1017, 1018		
Atmos Press. (m bar)		1015		1017		1 day post (m bar)			1017		
GROUNDWATER / NAPL - PHYSIO-CHEMICAL PARAMETERS											
Exploratory Hole No	Water Surface (mbgl)	Base Depth (mbgl)	LNAPL Surface (mbgl)	DNAPL Surface (mbgl)	Water Quality Indicators						Remarks
					ORP (mV)	SPC (µs/cm)	C (µs/cm)	Ph (value)	DO (mg/L)	Temp (°C)	
BH01	0.94	5.67	nd	nd	nt	nt	nt	nt	nt	nt	
BH03	2.72	5.43	nd	nd	nt	nt	nt	nt	nt	nt	
BH06	1.75	3.46	nd	nd	nt	nt	nt	nt	nt	nt	
WS03	1.96	2.06	nd	nd	nt	nt	nt	nt	nt	nt	
WS04	Dry	1.13	nd	nd	nt	nt	nt	nt	nt	nt	
WS05	0.86	0.93	nd	nd	nt	nt	nt	nt	nt	nt	

Notes

nt = not tested
nd = not detected

Data Compiled by: JP
Data Checked by: JP



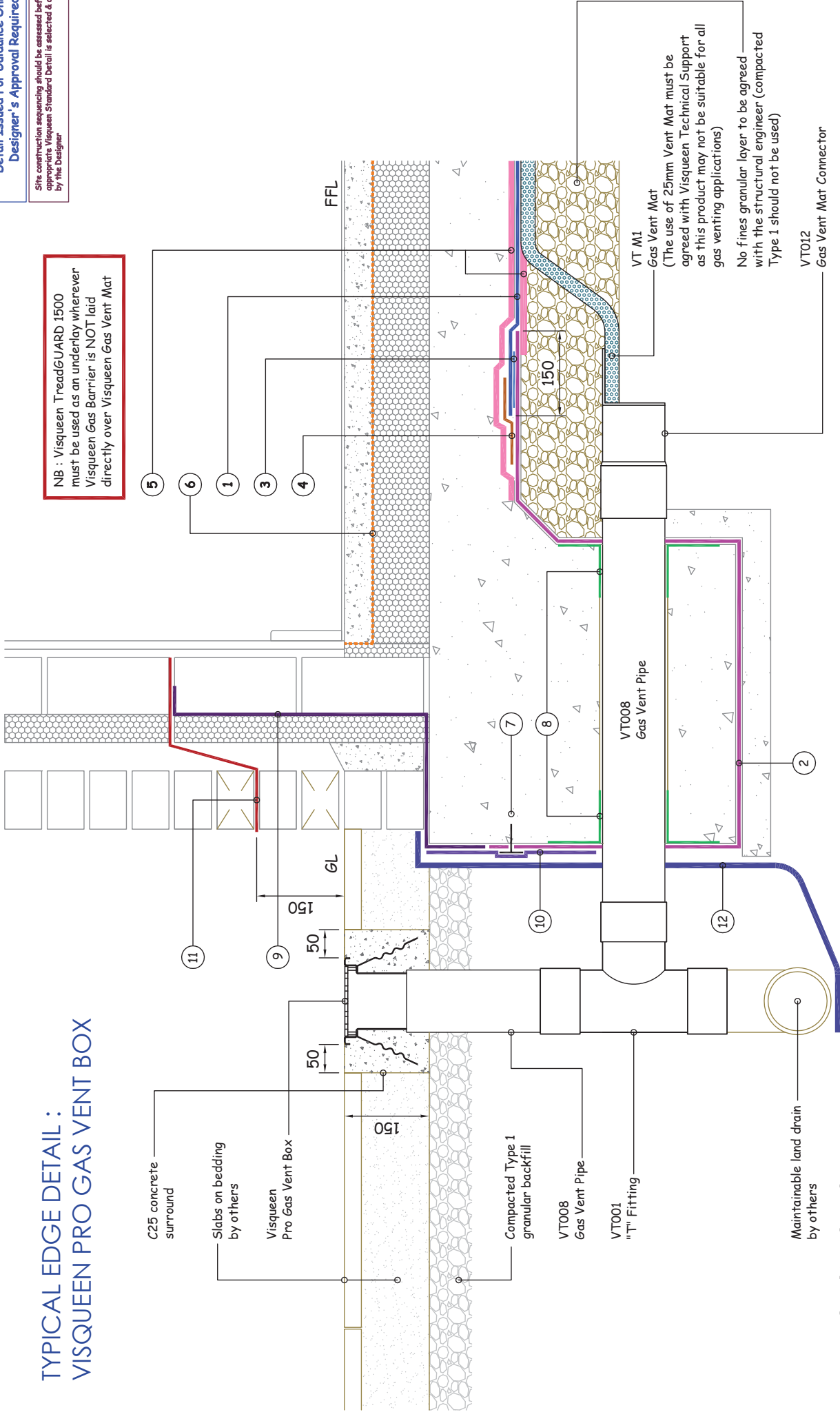
APPENDIX III

DATA SHEETS

Detail Issued For Guidance Only,
Designer's Approval Required

Site construction sequencing should be assessed before the application of Visqueen Standard Detail is selected & approved by the Designer

NB : Visqueen TreadGUARD 1500 must be used as an underlay wherever Visqueen Gas Barrier is NOT laid directly over Visqueen Gas Vent Mat





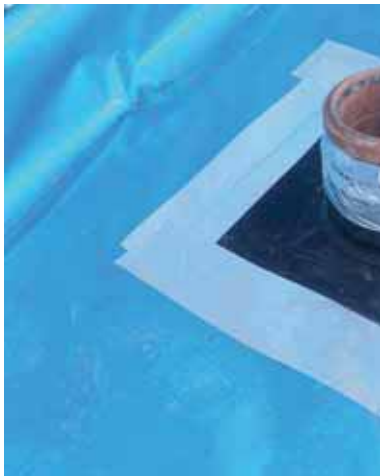
Visqueen Building Products
Contact Technical Support :
t : 0333 202 6800
f : 0333 202 6886
e : enquiries@visqueenbuilding.co.uk
www.visqueenbuilding.co.uk

Title : Typical Edge Section Showing Visqueen Pro Gas Vent Box.

Drg. No. P6VB-03.	Date. 02. 2015	Scale . NTS	© COPYRIGHT RESERVED.
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Key : Visqueen Gas Protection Membranes / DPC :-

1.	Visqueen Gas Barrier.	7.	Visqueen Retaining Discs @ 400mm centres.
2.	Visqueen Ultimate GeoSeal.	8.	Visqueen Gas Resistant Preformed Top Hat Unit.
3.	Visqueen 100mm Double Sided Tape.	9.	Visqueen TorchOn Tanking on HP Tanking Primer.
4.	Visqueen 150mm GR Lap Tape.	10.	Visqueen 300mm Detailing Strip.
5.	Visqueen TreadGUARD 1500.	11.	Visqueen Zedex High Bond cavity tray.
6.	Visqueen High Performance Vapour Barrier.	12.	Visqueen Protect&Drain.



- **BBA approved, fully complies with BS8485:2015**
- **Low permeability to methane, radon and carbon dioxide**
- **Approved for use in NHBC Amber 2 applications**
- **Multi-layer reinforced LDPE membrane with aluminium core**
- **High puncture and tear resistance**

Description

Visqueen Gas Barrier is a 400 gsm multi-layer reinforced polyethylene membrane with an integral 20 micron aluminium foil that is approved for use in BS8485:2015 and NHBC Amber 2 applications. For ease of identification on site Visqueen Gas Barrier is coloured blue on one side and silver on the reverse. The barrier combines strength and performance with flexibility and easy installation. Visqueen Gas Barrier also acts as a damp proof membrane.

BS8485:2015

When risk assessing under BS8485:2015 for sites which are effected by methane and carbon dioxide then the Visqueen Gas Barrier is an ideal solution.

The membrane has been modified to be 400 gsm with the multi layer structure greatly enhanced to improve its puncture and impact performance.

Visqueen utilise a 20 microns foil to avoid issues associated with thinner (12microns) foils.

Application

The Building Regulations require that proper precautions be taken to prevent danger to health and safety when building on contaminated land. Visqueen Gas Barrier offers a safe solution for the protection of buildings against methane, radon, stythe (a gas commonly found from disused mines, also known as blackdamp), and carbon dioxide, when installed in accordance with the relevant codes of practice such as BRE, CIRIA and the Chartered Institute of Environmental Health Ground Gas Handbook

Typically these are sites previously used as coalfields, landfill or are contaminated industrial sites.

The membrane should be installed blue side up

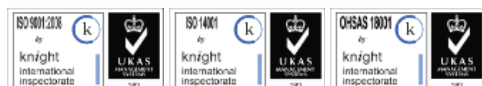
System components

- Visqueen Double Sided Jointing Tape
- Visqueen Gas Resistant (GR) Foil Tape
- Visqueen Top Hat Units
- Visqueen TreadGUARD1500
- Visqueen Detailing Strip

Installation Guidelines

Visqueen Gas Barrier and ancillary components must be installed in accordance with the recommendations of Building Research Establishment BRE 414 "Protective measures for housing on gas contaminated land" and CIRIA C665 "Assessing risks posed by hazardous ground gases to buildings", NHB C guidelines, and the Chartered Institute of Environmental Health Ground Gas Handbook. The product is not intended for use where there is a risk of hydrostatic pressure. **The membrane should be installed blue side up**

The membrane should be installed on a compacted sand blinding layer or smooth concrete float finish. In areas where high levels of unsupported membrane occur it is recommended that Visqueen Pre Applied Membrane is used. To avoid slip or shear planes and high compressive loadings it is not recommended



to take the membrane through the wall. In order to provide a continuous barrier across the cavity Visqueen Gas Resistant DPC should be taken through the blockwork and incorporated below the damp proof course cavity tray in the outer leaf.

Laps can be joined together by either using the Visqueen Gas Barrier jointing system or welded by our specialist on-site contractors.

Jointing and Sealing

Visqueen Gas Barrier should be overlapped by at least 150mm (Welded membranes can be by less than 150mm as long as the joint integrity is not compromised) and bonded with Visqueen Double Sided Tape. The joint should be secured with Visqueen Foil Backed Girth Jointing Tape. Ensure that the membrane is clean and dry at the time of jointing

Airtight seals should be formed around all service entry points. Visqueen Pre-formed Top Hat Units must be used for sealing service entry pipes. The base of the top hat should be sealed using Visqueen Double Sided Tape and Visqueen Foil Backed Girth Jointing Tape is used to secured the joint

Punctures

If the membrane is punctured or perforated, then a patch of material with identical thickness should be lapped at least 150mm beyond the limits of the puncture and bonded with Visqueen Double Sided Jointing Tape and seal with Visqueen Foil Backed Jointing Tape. Alternatively a patch can be formed using Visqueen Detailing Strip and lapped at least 150mm beyond the limits of the puncture. External and Internal corners should be round and reinforced with Visqueen Detailing Strip. Where this is not possible and the 3 dimensional shapes are complex it is recommended a pre-formed unit is used.

NB. In demanding site conditions use Visqueen GR Lap Tape as a high performance alternative to Visqueen Foil Jointing Tape.

Ventilation

When medium to high levels of ground gases are present or when the generation of gases still occurs, then an open void beneath the ground floor should be constructed, as ventilation beneath the ground floor will dilute and disperse the gases to atmosphere. Open voids are normally restricted to beam and block floors or other precast concrete floor systems, an alternative for providing ventilation to in situ concrete floor slabs is to install a Visqueen Ventilation System.

Covering

Visqueen Gas Barrier should be covered by a protective layer as soon as possible after installation. 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 contacting the barrier.

It is recommended that the barrier is covered with Visqueen Protection Boards or screed before positioning the reinforcement. When underfloor heating is being installed, it is recommended that the barrier is positioned between the blinded hardcore and insulation. This will protect the insulation from moisture and avoid any risk of overheating the membrane.

Storage and Handling

Visqueen Gas Barrier is classified as non-hazardous when used in accordance with the relevant Code of Practice (CP 1021973). The product is chemically inert and is not affected by acids and alkalis that may be present in the sub-soils. The material is not recommended for uses where it will be exposed to long periods of outdoor weathering as exposure to ultraviolet light will embrittle the product. Weathering will not occur when the membrane is installed in accordance with CP102 1973. Care should be taken to avoid accidental damage when handling the membrane on site. When the weather is cold, Visqueen Double Sided Jointing Tape and Visqueen Foil Backed Girth Jointing Tape should be kept in a warm, dry place until needed. Installation is not recommended below 5°C.

Technical Data and CE Mark



Gas Barrier

CE Mark to EN 13967

Visqueen Gas Barrier complies with the requirements and clauses of EN 13967 - Flexible sheets for waterproofing - Plastic and rubber damp proof sheets including plastic rubber basement tanking sheet - Definitions and characteristics.

British Board of Agreement performed the initial inspection of the manufacturing plant and of factory production control and the continuous surveillance, assessment and evaluation of factory production control, and issued the certificate of constancy of conformity of the factory production control 0836-CPR-13/F060 applies.



Product Data

Gas Barrier

CE Mark to EN 13967

Product Data

heading	Characteristic	Test method	Units	Compliance criteria	Value or Statement
	Visible defects	EN 1850 -2	-	Pass/Fail	Pass
	Length	EN 1848-2	m	-0%/+10%	25 or 50
	Width	EN 1848-2	m	-0%/+10%	2
	Thickness	EN 1849-2	mm	-10%/+10%	0.52
	Mass	EN 1849-2	g/m2	-7%/+7%	400
	Tensile Strength - MD	EN EN12311	N	>MLV	350
	Tensile Strength - CD	EN EN12311	N/mm2	>MLV	350
	Tensile Elongation - MD	EN EN12311	%	>MLV	17
	Tensile Elongation - CD	EN EN12311	%	>MLV	15
	Joint Strength	EN12317-2	N	>MLV	332
	Watertightness 2kPa	EN 1928	-	Pass/Fail	Pass
	Resistance to impact	EN 12691	mm	>MLV	200
	Dart Impact	BS 2782	g	MDV	731
	Low temperature flexibility	EN 495-5	oC	-40	Pass
	Durability against ageing	EN 1296 and EN 1928	-	Pass/Fail	Pass
	Durability Chemical Resistance	EN 1847	-	Pass/Fail	Pass
	Resistance to tearing (nail shank) CD	EN 12310-1	N	MDV	358
	Resistance to tearing (nail shank) MD	EN 12310-1	N	MDV	368
	Resistance to static loading	EN 12730	Kg	>MLV	Pass 20
	Water vapour transmission - resistance	EN 1931	MNs/g	MDV	7000
	Water vapour transmission - permeability	EN 1931	g/m2/d	MDV	0.03
	Reaction to Fire	EN 13501-1	Class	MDV	F
BS8485:2015 testing requirements					
	Mass	EN 1849-2	g/m2	Average >370	400
	Methane Permeability	ISO15105-1	mls/m2/d/atm	Pass/Fail	<40 Pass
	Puncture CBR	BS EN ISO 12236	N	MDV	1114
	Impact resistance	EN12691	mm	MDV	1000
	Tensiles Yield strength MD	ASTM D4885-01	kN/m	MDV	12.5
	Tensiles Yield strength CD	ASTM D4885-02	kN/m	MDV	7.3
	Yield elongation MD	ASTM D4885-03	%	MDV	18
	Yield elongation CD	ASTM D4885-04	%	MDV	19
	Tear resistance - trouser method A - MD	BS ISO 34-1	kN/m	MDV	48.2
	Tear resistance - trouser method A - CD	BS ISO 34-1	kN/m	MDV	44.8
	Tear resistance - angle method B - MD	BS ISO 34-1	N	MDV	53.5
	Tear resistance - angle method B - CD	BS ISO 34-1	N	MDV	60.6



About Visqueen

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- [Damp Proof Course](#)
- [Damp Proof Membranes](#)
- [Gas Protection and Gas Venting](#)
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- [Standard Details](#)
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- [Visqueen Gas Protection Brochure](#)
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- [Material Safety Datasheets](#)
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- System design including CAD details

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The specification, technical design, and installation of gas protection systems, enabling the sustainable regeneration of brownfield sites.



Structural Waterproofing CPD

The specification, technical design, and installation of structural waterproofing systems for protection against water and damp ingress in both above and below ground projects.



Visqueen Training Academy

We are now able to offer exclusive in depth training opportunities on a wide variety of Visqueen products at our Training Academy.



Visqueen Special Projects

We provide high-level expertise, comprehensive support and experience in all types of waterproofing and gas protection.



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0333 202 6800 enquiries@visqueen.com www.visqueen.com

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Gas Resistant Self Adhesive Membrane

CE Mark to EN 13969



- Self-adhesive membrane for above and below ground application
- Superior adhesion and waterproofing qualities
- Integral aluminium foil for resistance to methane, radon and carbon dioxide

Description

Visqueen Gas Resistant (GR) Self Adhesive Membrane is designed to prevent the transmission of carbon dioxide, radon and methane gases in tanking applications or where hydrostatic pressure is present.

Resistance to gas is achieved by an integral aluminium film. Substrates should be primed with Visqueen HP Tanking Primer prior to application. Visqueen Gas Resistant (GR) Self Adhesive Membrane is compatible with Visqueen Gas Resistant (GR) DPC and other Visqueen Gas Membranes.

Application

Visqueen Gas Resistant (GR) Self Adhesive Membrane should be used on any site where carbon dioxide, radon or methane is a problem. Methane and carbon dioxide will occur on any sites previously used for landfill as a result of bacteriological conditions. Such conditions can exist on household, commercial and industrial sites. Adequate ventilation must be ensured at all times during application.

Visqueen Gas Resistant Self Adhesive Membrane is not suitable for any roofing or podium applications.

Additionally radon has been identified as being present in some 21 counties in England by the National Radiological Protection Board.

Storage & Handling

Visqueen Gas Resistant (GR) Self Adhesive Membrane should be stored in cartons, on end and kept dry above 10°C. Visqueen Gas Resistant (GR) Self Adhesive Membrane is classified as nonhazardous when used in accordance with the relevant British Standards.

Visqueen HP Tanking Primer should be stored in original unopened containers in a cool dry area. Suitable Personal Protective Equipment (PPE) should be worn when using in line with our health and safety datasheet.

Installation Instructions

Ensure that the surface to be treated is free from loose particles, dry and frost free. Installation should be in accordance with BS 8102:2009. All surfaces should be sealed using Visqueen HP Tanking Primer and allowed to dry thoroughly.

A suitable drainage system should be designed and incorporated in accordance with the requirements of BS8102:2009. All surfaces should be free from ice, frost or condensation.

Slabs must be surface dry, free from sharp protrusions and any hollows filled with high strength mortar. All surfaces should be primed using Visqueen HP Tanking Primer applied by brush or roller and allowed to dry before the application of Visqueen Gas Resistant Self Adhesive Membrane.

VISQUEEN
BUILDING PRODUCTS



Gas Resistant Self Adhesive Membrane

CE Mark to EN 13969

Page 2

Visqueen Gas Resistant Self Adhesive Membrane should be laid by peeling back the protective silicone release paper and applying the self adhesive face onto the prepared surface.

The material should be brushed on to the surface to ensure good initial bond and remove any trapped air. Adjacent rolls are aligned and overlapped a minimum of 150mm at side and ends and the overlaps must be thoroughly rolled with a firm constant pressure to ensure a complete and continuous adhesion to achieve gas tight integrity between the layers.

To provide complete security of the system, care must be taken when detailing service penetrations and changes of levels. The use of angle fillets and reinforcing strips is essential. Visqueen Gas Resistant Self Adhesive Membrane is fully compatible with other elements of the Visqueen Gas Protection System.

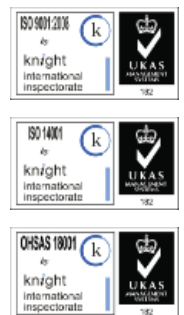
After installation the membrane should be covered as soon as possible with Visqueen TreadGUARD1500/ Protect&Drain or other protective layer. Any punctures or damaged areas should be cleaned and patched with the membrane.

Visqueen Gas Resistant (GR) Self Adhesive Membrane must be continuous with the Visqueen Gas Resistant DPC in surrounding walls and all laps must be sealed.

Technical Data and CE Mark

Visqueen Gas Resistant Self Adhesive Membrane complies with the requirements and clauses of EN 13969.

British Board of Agreement performed the initial inspection of the manufacturing plant and of factory production control and the continuous surveillance, assessment and evaluation of factory production control, and issued the certificate of constancy of conformity of the factory production control 0836-CPR-13/F062 applies.



Gas Resistant Self Adhesive Membrane

CE Mark to EN 13969

Product Data

Product Data

Characteristic	Test method	Units	Compliance criteria	Value or statement
Length	EN 1848-2	m	-0%/+5%	20
Width	EN 1848-2	m	-5%/+5%	1
Thickness	EN 1849-2	mm	-5%/10%	1
Mass	EN 1849-2	g/m2/	-10%/10%	1100
Watertightness	EN 1928	-	Pass/Fail	Pass 60Kpa
Durability after artificial ageing)	EN 1847	-	Pass/Fail	Pass 60Kpa
Durability against chemicals	EN 1847	-	Ps	Pass 60Kpa
Resistance to tearing (nail shank) MD	EN 12310-1	N	>	100
Resistance to tearing (nail shank) CD	EN 12310-1	N	>	100
Water vapour transmission properties	EN 1931	g/m2/d	MDV	0.013
Resistance to static loading	EN 12730	Kg	>MLV	20
Resistance to Impact	EN 12691	mm	>	500
Reaction to fire	EN 13501-1		Class	F
Joint Resistance	EN 12317-1	N	>	30
Tensile properties - MD	EN 12311-2	N/mm2	>	2
Tensile properties - CD	EN 12311-2	N/mm2	>	2
Tensile Elongation - MD	EN 12311-1	%	>	130
Tensile Elongation - CD	EN 12311-2	%	>	130
Reaction to Fire	EN 13501-1	Class	MDV	F
Methane permeability	ISO 7229	ml/m2/d	MDV	33
Radon Diffusion		m2/d		5.0 x 10 (-14)



Gas Resistant Self Adhesive Membrane

CE Mark to EN 13969

Appendix A



Visqueen Building Products

Visqueen is the market leader in the manufacture and supply of structural waterproofing and gas protection systems. Visqueen offers the complete package - a proven, reliable range backed by a technical support service that goes unmatched in the market - everything you would expect from a reputable and ethical company.

System Accessories

To ensure full waterproofing protection please use the following certified system components:

- Visqueen High Performance (HP) Tanking Primer
- Visqueen TreadGUARD1500
- Visqueen Protect&Drain
- Visqueen Top Hat Unit

Downloads Library

- Technical Datasheet
- Declaration of Performance
- Visqueen's Guide to CE Marking

Find your local stockist

Search our directory of Visqueen specification Stocking Centres to locate your nearest Visqueen Partner.

Distributor Support

Our specification Stocking Centres can access a free library of sales support tools, bespoke catalogues and more, [click here](#).

Technical support throughout your project

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- Nationwide site support team
- Specification advice
- Installation guidance & project sign off
- System design including CAD details





GAS VENTING SYSTEMS

FULL BROCHURE COMING SOON

Gas Fittings Index Detail

All buried fittings and pipes are HDPE (High Density Polyethylene) unless stated

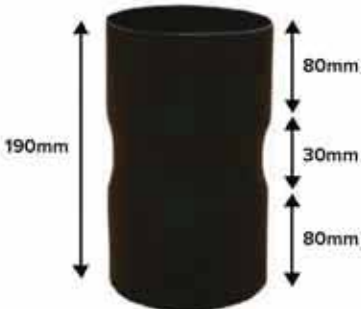
- Twin Wall
- Smooth



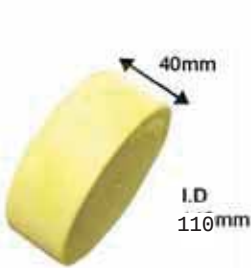
VT001 'T' Fitting* □



VT002 90° Bend* □



VT003 Coupling* ** □



VT004 End Cap □



VT006 Slotted Carrier Pipe □



VT007 Slitted Carrier Pipe ■



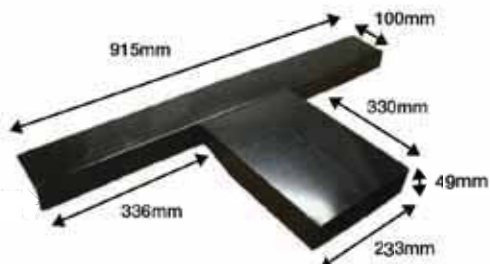
VT008 Gas Vent Pipe ■



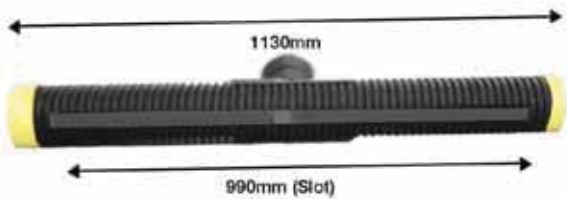
VT009 Flexible Connector Pipe ■

All buried fittings and pipes are HDPE (High Density Polyethylene) unless stated

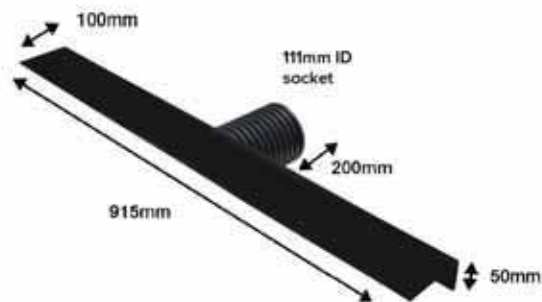
- Twin Wall
- Smooth



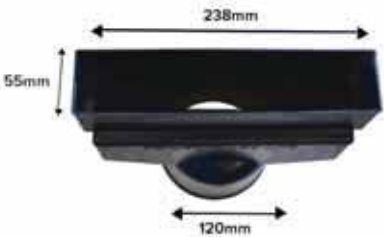
VT010 Gas Vent Mat Connector □



VT011 Gas Vent Mat Connector Slotted ■



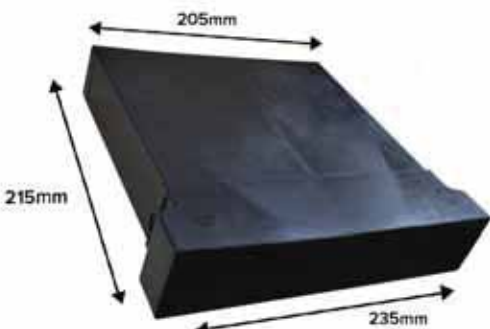
VT012 Gas Vent Mat Connector with Pipe □



VT013 Vent Pipe Vent Adaptor □



VT014 Adjustable Z Vent □



VT015 Extension Sleeve* □

Visqueen Gas Venting Product Index

Gas Vent Mat	
Product Reference	Product Description
VT M1	Gas Vent Mat

Gasflow Fittings	
Product Reference	Product Description
VT001	T Fitting
VT002	90 degree Bend
VT003	Coupling
VT004	End Cap
VT006	Slotted Carrier Pipe
VT007	Slitted Carrier Pipe
VT008	Gas Vent Pipe
VT009	Flexible Connector Pipe
VT0010	Gas Vent Mat Connector
VT0011	Gas Vent Mat Connector Slotted
VT012	Gas Vent Mat Connector with Pipe
VT013	Vent Pipe Adaptor
VT014	Adjustable Z Vent
VT015	Extension Sleeve (Horizontal & Vertical)

Outlets	
Product Reference	Product Description
VT020A	VisqueenPRO Gas Vent Box – Galvanised
VT020B	VisqueenPRO Gas Vent Box – Stainless Steel
VT023A	Gas Vent Bollard Stainless Steel
VT023C	Gas Vent Bollard Plastic
VT024A	Airbrick Black
VT024B	Airbrick Terracotta



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- @visqueenBP
- Visqueen Construction



Visqueen Gas Vent Mat

In accordance with BS8485 and BS8102



- **Lightweight and easy to lay with high gas flow capacity**
- **Creates a depressurisation zone for collection of ground gases**
- **Unrivalled technical and design support**
- **Cost effective compared to traditional below slab perforated pipework and fill**

Description

Visqueen Gas Vent Mat comprises a cusped HDPE (High Density Polyethylene) core bonded to a nonwoven polypropylene geotextile filter membrane. Visqueen Gas Vent Mat is 25mm thick and supplied in 900mm x 50m roll format.

Application

Visqueen Gas Vent Mat is specifically designed to overcome the problem of high levels of gas concentrations underneath buildings. When dealing with VOC (Volatile Organic Compounds) our venting solutions form an integral part of a passive system designed to deal with the problem of contaminating gas through dilution to safe levels.

Visqueen Gas Vent Mat has been developed and tested extensively in line with the 'DETR Partners in Technology Report – 1997' and is an integral part of venting design used in BS8485 code of practice and various Ciria guidelines including C665 and the forthcoming RP938. The design of the primary gas protection layer and complete venting system is determined by gas type, concentrations and emission rates and is determined by a points system.

Vent mat can also be used as a heavy-duty protection medium over tanking membranes and facilitate drainage in high risk situations, the product forms a void to collect and transmit water into adjacent drainage outlets or collector pipes. Geotextile filter side to face direction of the ground water or the backfill medium in accordance to BS8102:2009 the system should be connected to a land drain that is also maintainable.

System Components

- [PRO Gas Vent Box](#)
- [Gas Vent Bollard](#)
- [Gas Flow Fittings](#)

Important Installation Information

Visqueen Gas Vent Mat is designed to be installed with the geotextile filter side of the product facing the direction of the gas flow.

For further information please see our Installation section.

Installation - gas venting

Visqueen Gas Vent Mat is designed to be installed with the geotextile filter side of the product facing the direction of the gas flow. The product can be laid as single widths at predetermined centres beneath a ground bearing slab or raft foundation to create a strip effect, or butted together to create a blanket. When laying in strip format, careful consideration should be given to the foundation and super structure design in order for the vent mat to be positioned accordingly to avoid over complex detailing. Please consult with the Visqueen Technical Support Team for assistance when designing and detailing a strip venting design system.

Visqueen Gas Vent Mat

In accordance with BS8485 and BS8102

Jointing

Where a blanket is required, unroll the mat into position. The next roll should be placed in a similar way to the first so the dimpled cores butt together.

The geotextile filter membrane extends beyond the width of the dimpled HDPE core at one side; this creates an overlap flap. Continue laying further rolls in a similar manner to create the blanket.

Complete system solution

Visqueen's Gas Vent Mat is a full system solution when connected to air inlets and outlets, allowing sufficient air changes to dilute gases to safe concentrations when designed correctly. Our full range consists of pipework, connectors and vent outlets to manage various design requirements. Please see our separate datasheets for connectors/pipework and vent outlets.

Installation – External tanking protection and drainage in accordance to BS8102:02009

Visqueen Protect&Drain is designed to be installed with the geotextile filter side (white face) of the product facing the direction of the water flow, backfill medium or slab.

- Rolls can be cut to length with a sharp knife.
- Unroll into position. Adjacent rolls should be placed in a similar way to the first so the dimpled cores butt together.

The geotextile filter membrane extends beyond the width of the dimpled HDPE core at one side; this creates an overlap flap which should be secured to the adjacent roll with VisqueenPro Single Sided Jointing Tape. Continue laying further rolls until the membrane is protected over its entire area.

Specification

Visqueen offer an unrivalled technical and design service. Please contact our technical helpline on 0845 302 4758 for further information. Venting systems should be designed on a site specific basis.



Visqueen Gas Vent Mat

In accordance with BS8485 and BS8102

Product Data

Product Data

heading	Characteristic	Test method	Units	Value or Statement
	Width		mm	900
	Length		m	50
	Thickness	EN ISO 9863-1	mm	25
	Compressive strength		kn/m2	300
	Roll weight		kg	74
	Roll diameter		m	1.3
	In-plane air flow capacity with soft/hard platens @ 20mm and 100kPa	BE EN ISO 12958	l/m/s	155
	Shear Strength	BE EN ISO 13426-2	kN	1

Visqueen Gas Vent Mat

In accordance with BS8485 and BS8102

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VisqueenPRO Gas Vent Box

A gas ventilation and water management system

Page 1 of 3



- Releases harmful gases safely
- Suitable for most applications
- Reduces the risk of rain water into the void
- Easy and secure installation
- Approved & tested to B125 (EN1433) load class
- Free flow area of grate 20148.3mm²

Description

VisqueenPro Gas Vent box is a high performance ground level vent box that when installed as part of Visqueen's gas venting system will safely disperse harmful gases to atmosphere and reduce the risk of rain water entering the void.

VisqueenPro Gas Vent box comprises of a galvanised base including a 110mm pipe inlet and adjustable feet to ease installation and secure the box to the concrete base. The galvanised lid is secured by a heavy duty grating lock mechanism. The lid has been tested to EN B125 (EN1433), a 12.5t load test thus ensuring the lid will perform under heavy loads. The lids are also 'heel' safe approved.



To view the vent box design please [click here](#)

The gas vent box is also available in stainless steel but please contact Visqueen's Technical Support Team for suitability and order requirements.
enquiries@visqueenbuilding.co.uk

System design – gas and water management

The 110mm pipe is connected to Visqueen T (twin) Fitting (VT001) which allows the system to be joined to the Visqueen gas vent system and the other to connect to the rain water/ land drainage system.

[Please click here to view a typical standard detail.](#)

VISQUEEN

BUILDING PRODUCTS

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OF BRITISH POLYTHENE LIMITED, COMPANY NUMBER:
350729, REGISTERED OFFICE: ONE LONDON WALL,
LONDON, EC2Y 5AB

STRUCTURAL WATERPROOFING AND GAS PROTECTION SYSTEMS

VisqueenPRO Gas Vent Box

A gas ventilation and water management system

Page 2 of 3

Application

Typical building applications are curtain walling and glazing where the system cannot be taken through a perimeter wall.

The ground vent box should be positioned preferably close to the perimeter wall and is suitable for load classes up to B 125 (EN 1433) which include pedestrian precincts, light vehicles and private car parks etc. It is not suitable for applications such as parking areas, service stations (cars) & slow-moving light commercial vehicles and other heavier duty applications.

Specification

The vent box has been thoroughly tested and conforms to EN B125 (EN 1433) – 12.5t load test.

Ensure the selected vent box is suitable for your intended application. The load test categories below provide industry guidance to the suitability for various applications. After the building has been occupied please ensure that the guidelines below on loadings are followed as Visqueen Building Products cannot take responsibility for traffic moving over the vent box. Where a 'cherry picker' type vehicle is used during building maintenance please ensure the vent box is plated to prevent damage.

If you require a vent box for classes above B125 please contact Visqueen Technical Team for be-spoke heavier duty lids.

Load class applications

There are six load classes recognised in BS EN 1433:2002.

- A 15 - Pedestrian, cycleways, minimally trafficked area (light domestic vehicles only)
- B 125 - Pedestrian precincts, light vehicles, private car parks & drives
- C 250 - Parking areas, service stations (cars) & slow-moving light commercial vehicles
- D 400 - Parking areas for all vehicle types
- E 600 - Industrial areas, heavy wheel loads, slow-moving HGV's & forklifts, service stations
- F 900 - Airport runways, very heavy industrial & military installations, service yards & lorry parks



SPECIFICATION SUPPORT

The following items are available to view online or to download from www.visqueenbuilding.co.uk

- Technical Datasheets
- Typical installation CAD details
- Health and Safety data

Register online for access to NBS Clauses and for information about our CPD Seminars



TECHNICAL SUPPORT

For advice on detailing or installation call Visqueen Building Products Technical Help Line 0845 302 4758. Pricing & Availability may be obtained from our UK Network of merchant stockists. For details of these call our Sales Office on 0845 302 4758.

VISQUEEN
BUILDING PRODUCTS

VisqueenPRO Gas Vent Box

A gas ventilation and water management system

Page 3 of 3

Installation

1. Ensure Type 1 concrete is fully compacted.
2. Connect gas vent unit to vent pipe. Top edge of unit 1mm below Finished Floor Level (FFL)
3. Back fill around unit with concrete to Strength Class C25/30 to a minimum of 50mm surrounding and under unit.
4. Clean off any concrete visible on gas vent unit with soapy water

Please click [here](#) to view a typical standard detail illustrating the above method

There are 4 small weep holes within the vent box to aid the galvanising process.

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- . Typical installation CAD details
- . Health and Safety data

Register online for access to NBS Clauses and for information about our CPD Seminars



TECHNICAL SUPPORT

For advice on detailing or installation call Visqueen Building Products Technical Help Line 0845 302 4758. Pricing & Availability may be obtained from our UK Network of merchant stockists. For details of these call our Sales Office on 0845 302 4758.

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APPENDIX IV

METHOD STATEMENTS



METHOD STATEMENT AND SAFE WORKING PROCEDURES ON-SITE GAS MEMBRANE VALIDATION:

1.0 SCOPE

To define the procedures to be followed in validating the installation of gas membranes.

The purpose of this procedure is to ensure that a suitable procedure is followed to confirm that gas membranes have been suitably installed by visual inspection and air lance testing where appropriate.

2.0 DEFINITIONS

The verification will be carried out in general accordance with CIRIA C735 'Good practice on the testing and verification of protection systems for buildings against hazardous ground gases', and will comprise visual inspection together with integrity testing consisting of air lance testing where appropriate.

Air lance testing will be carried out in general accordance with ASTM D4437-08:2013.

3.0 RESPONSIBILITIES

The Project Leader shall ensure that only suitably trained staff shall undertake gas membrane validation.

The validator is responsible for complying with site rules and any specific contractor method statement.

4.0 PROCEDURES

Personal Protective Equipment (PPE)

In addition to the minimum PPE requirements the validator shall always wear disposable gloves when inspecting membrane.

Validation Process

The verification will be carried out in general accordance with CIRIA C735 'Good practice on the testing and verification of protection systems for buildings against hazardous ground gases', and will comprise visual inspection together with integrity testing consisting of air lance testing.

Based on the Gas Classification (in accordance with BS8485) where known, or the contractor requirements the validation will comprise site visits by an independent verifier (ASL) to inspect the installed membranes.

The independent validation inspection visits, including any integrity testing works, will be carried out by experienced geologists, engineers and scientists who are experienced in these works and have been suitably trained in-house.

The inspections will include detailed visual inspection of the membrane integrity, the quality of all welded or taped seams and taped sealing around penetrations such as pipes.



Where required, air lance integrity testing will also be completed along all seams and joints prior to all concrete pours. Air lancing integrity testing is deemed to be the most appropriate testing method due to the easily observable results, non-destructive methodology and ease of use.

Air lance integrity testing comprises the use of a compressor to pressurise air to a minimum pressure of 345 Kpa (50 psi). This air is then directed at joints and seals in the membrane using a hose and nozzle of 4.8mm in diameter, at a distance of no more than 50mm. The verifier will then observe the surface of the membrane for any air pockets building up beneath the membrane surface. Any air pockets will signify that the membrane is not correctly sealed.

The verifier will request that any defects in the membrane or welds and seals, either identified by a visual inspection or by air lance testing, are suitably repaired by the installer before confirming that the gas protection measures have been suitably installed.

The findings of each validation visit, including the results of any integrity testing, will be recorded on suitable pro-forma. Photographs will be taken showing the general level of workmanship and will show the membrane, seals and any other details that require specific installation techniques. The validator will confirm that suitable protection will be placed as soon as is practical following placement to reduce the risks of the membrane becoming damaged.



APPENDIX V

VERIFICATION RECORD SHEET

GAS PROTECTION MEASURES VALIDATION AND VERIFICATION TEST REPORT

Project Name:
Project No.
Inspection carried out by:

Plot(s):

Date:

Reason for Gas Protection (if known):

Level of Gas Protection Required or Gas Protection to be Validated:

Installer	
Gas Membrane Product	
Gas Membrane Condition	
Joints Double Taped or Welded	
Penetrations Sealed	Yes/No
Repairs required?	Yes/No
Ventilation Installed	Yes/No
Type of Ventilation	
Vent Spacing	
Membrane Installed across Cavity	Yes No Not Seen N/A
Integrity Testing required	Yes/No
Air Lance Testing	Yes/No
Tracer Gas Testing	Yes/No

General Comments:

Verifier Signature

Installer Representative Name.....Signed.....Company.....

Site Representative Name.....Signed.....Company.....



APPENDIX II

PHOTOGRAPHS

Plate 1 Membrane - (27/02/2020)



Plate 2 Column Detail - (27/02/2020)



Plate 3 Membrane Seal - (27/02/2020)

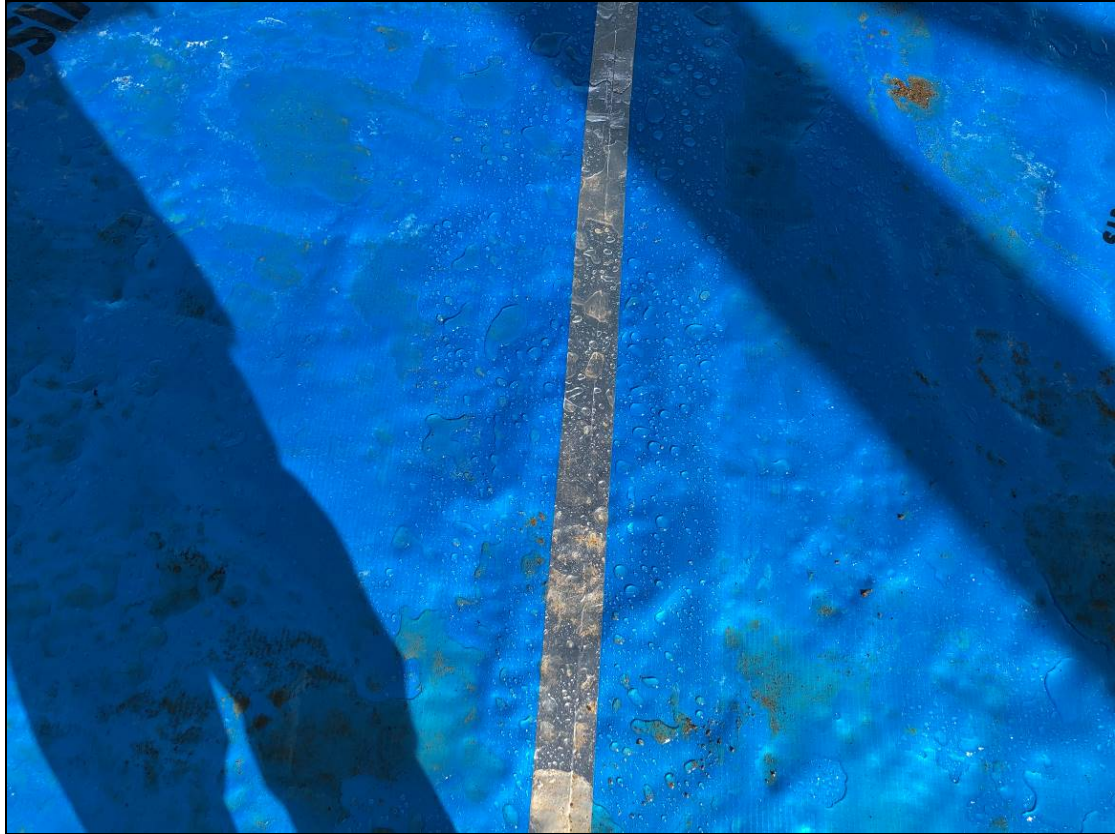


Plate 4 Double Taped Seams - (27/02/2020)



Plate 5 Column Detail - (12/03/2020)



Plate 6 Column Detail - (12/03/2020)

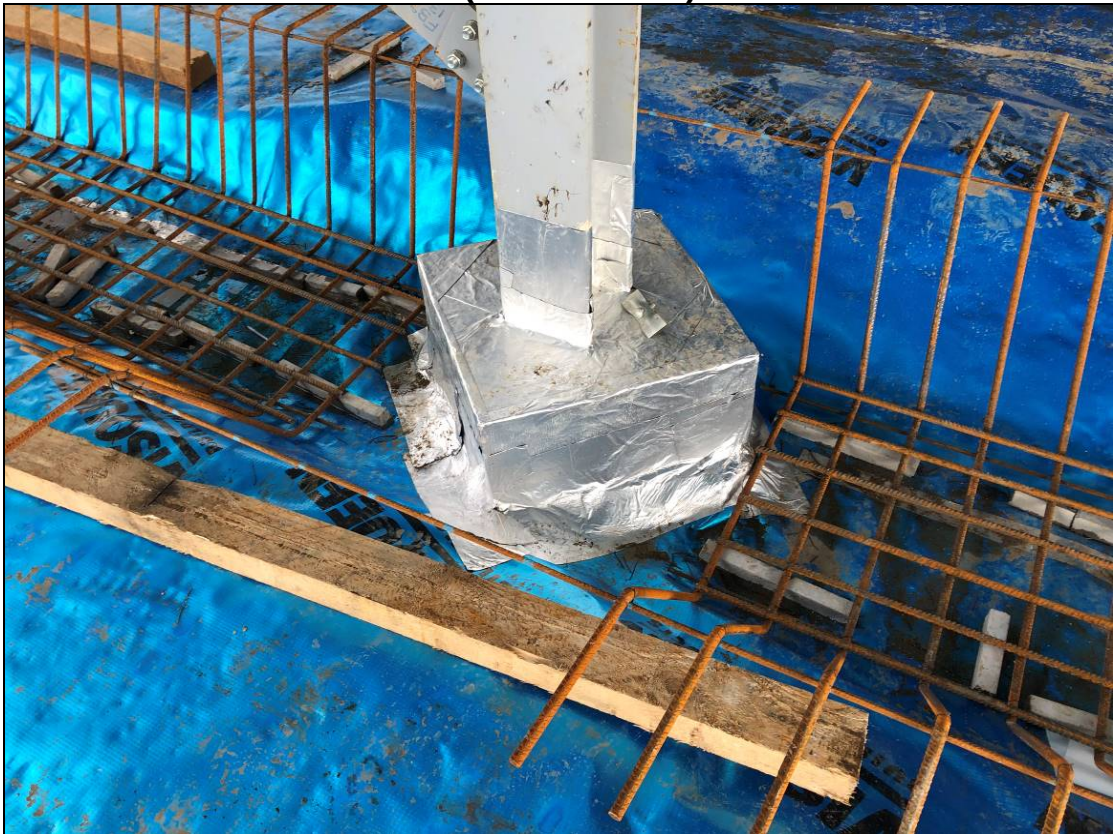


Plate 7 Membrane Seal - (12/03/2020)

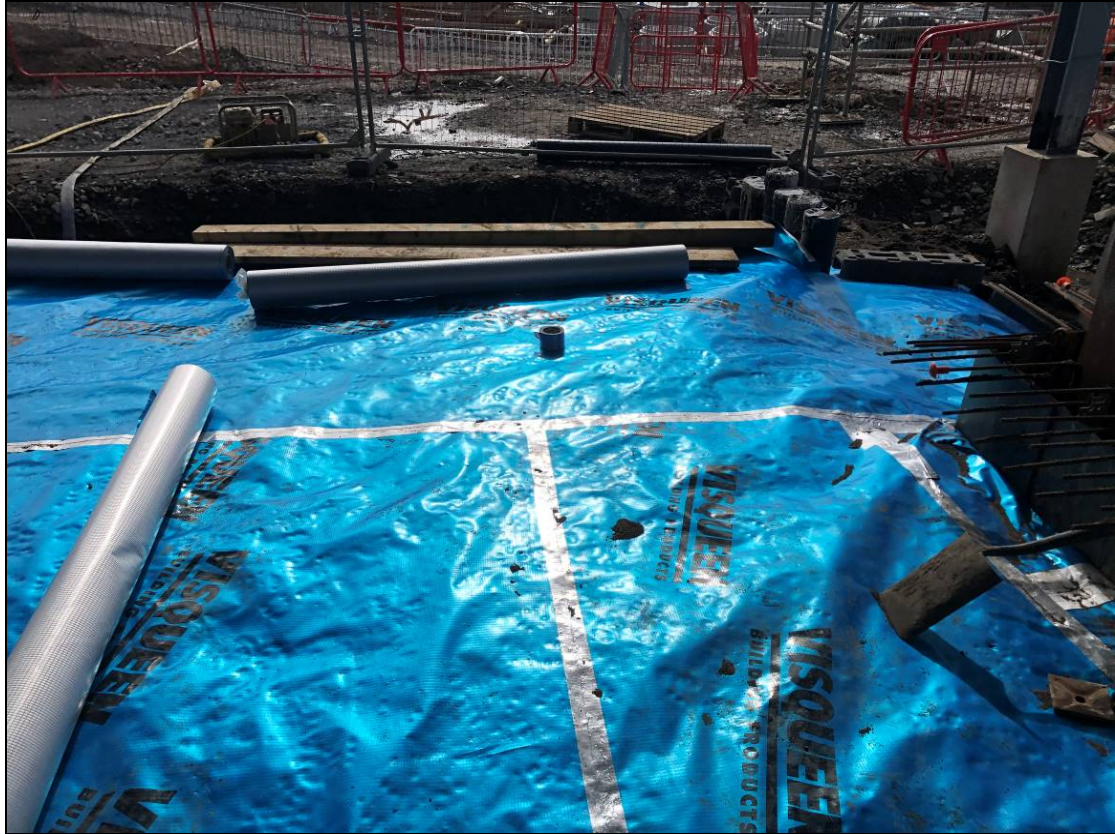


Plate 8 Membrane - (08/04/2020)



Plate 9 Membrane - (08/04/2020)



Plate 10 Column Detail - (08/04/2020)



Plate 11 Membrane Seal - (08/04/2020)

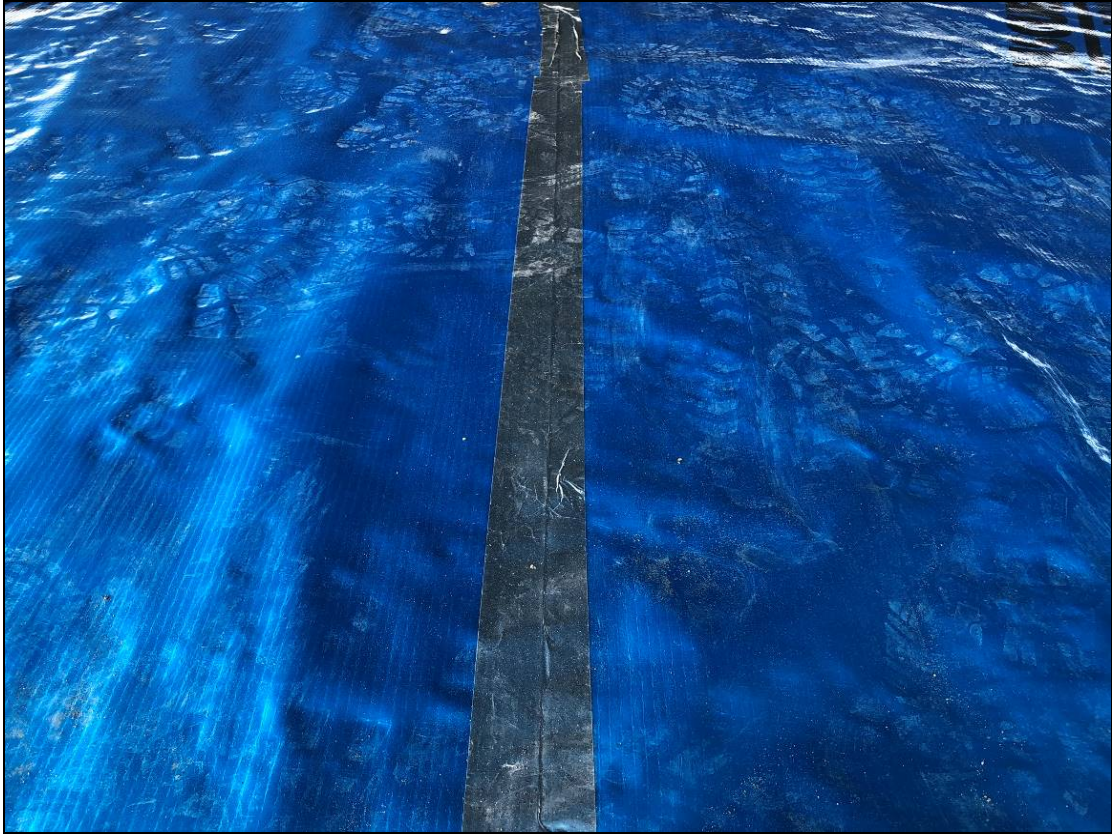


Plate 12 Pipe Penetrations - (08/04/2020)



Plate 13 Membrane - (22/04/2020)



Plate 14 Sealed Penetrations - (22/04/2020)

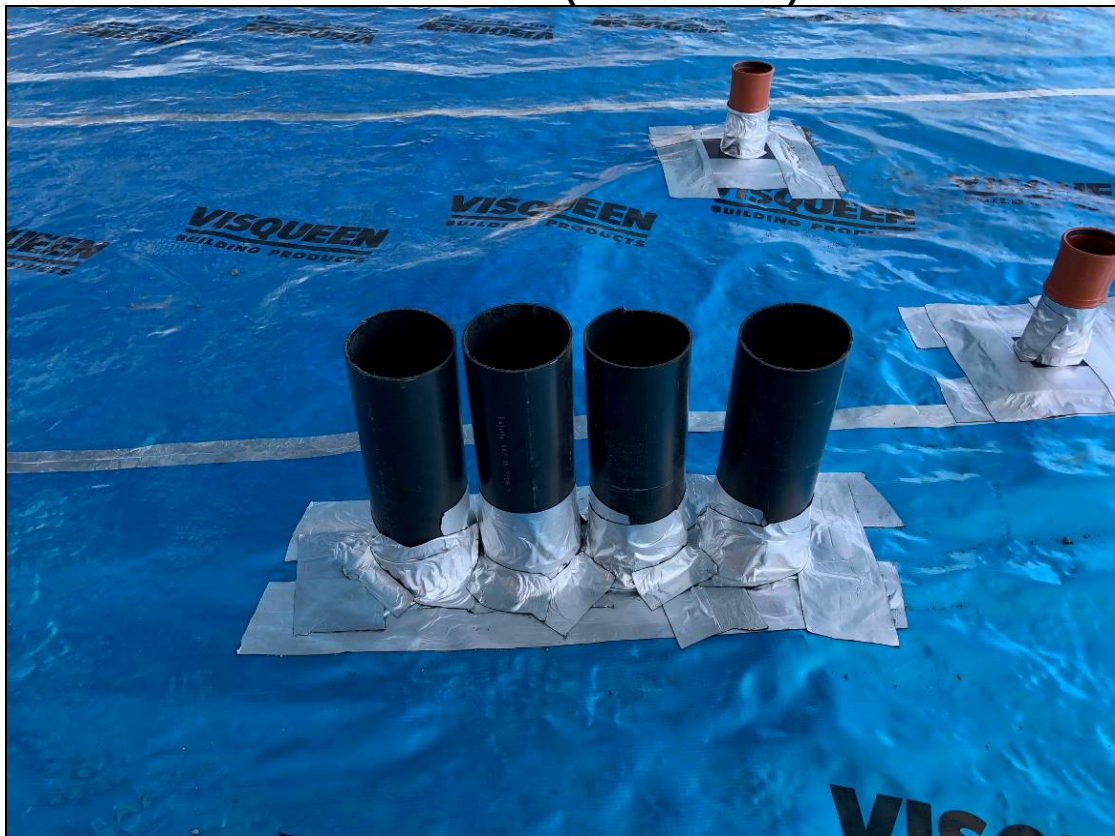


Plate 15 Sealed Penetrations – (22/04/2020)

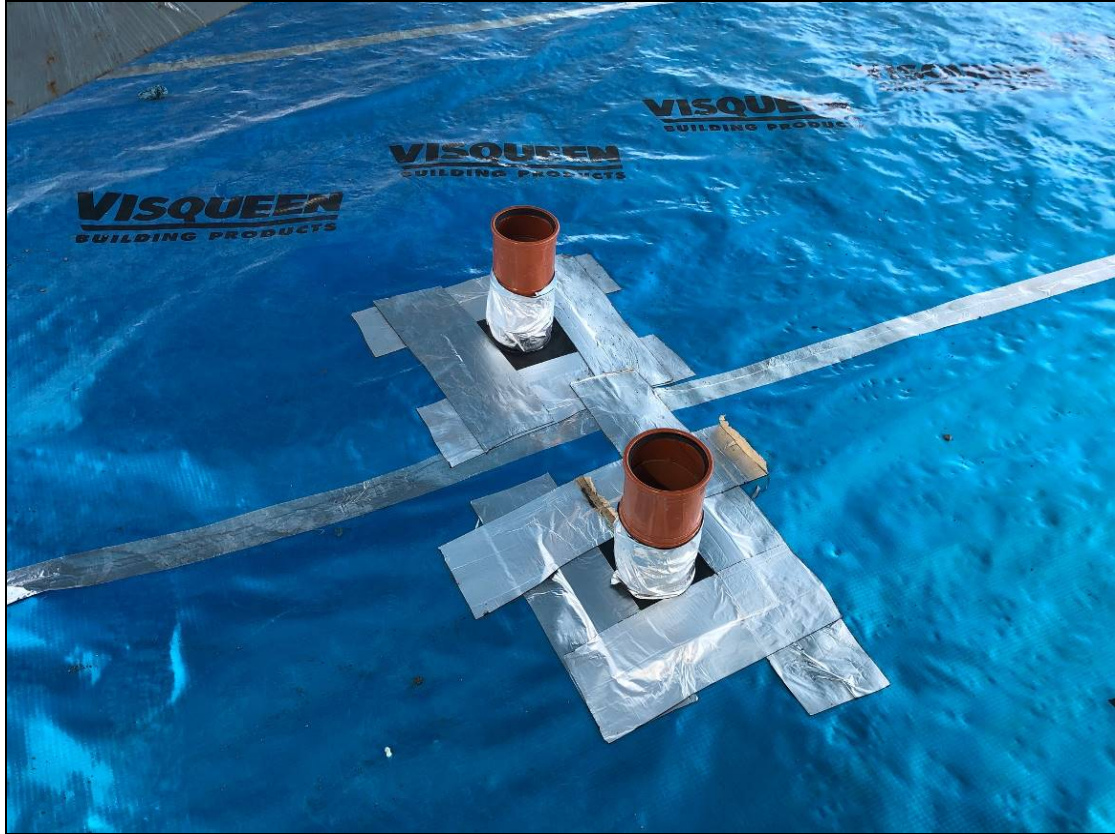


Plate 16 Sealed Penetrations – (22/04/2020)



Plate 17 Column Detail - (22/04/2020)



Plate 18 Membrane - (12/05/2020)



Plate 19 External Sealing to Lift Pit - (12/05/2020)

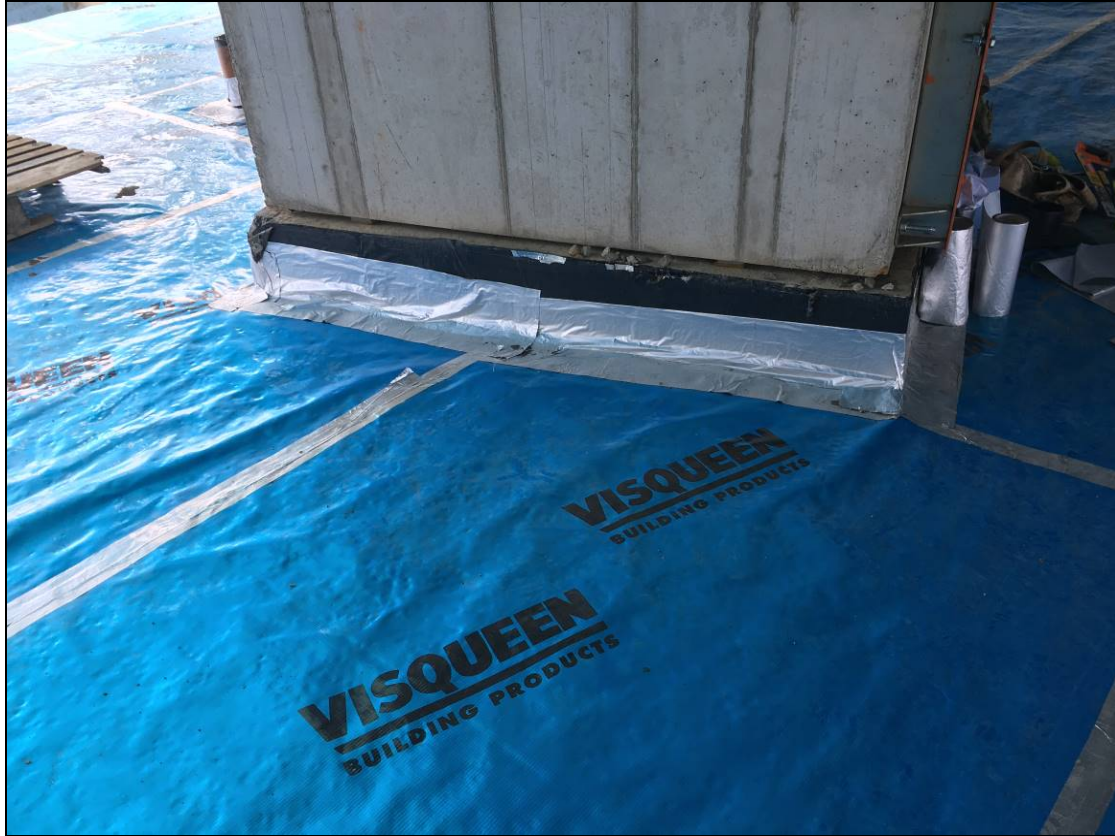


Plate 20 Sealed Penetration - (12/05/2020)



Plate 21 Membrane - (22/05/2020)

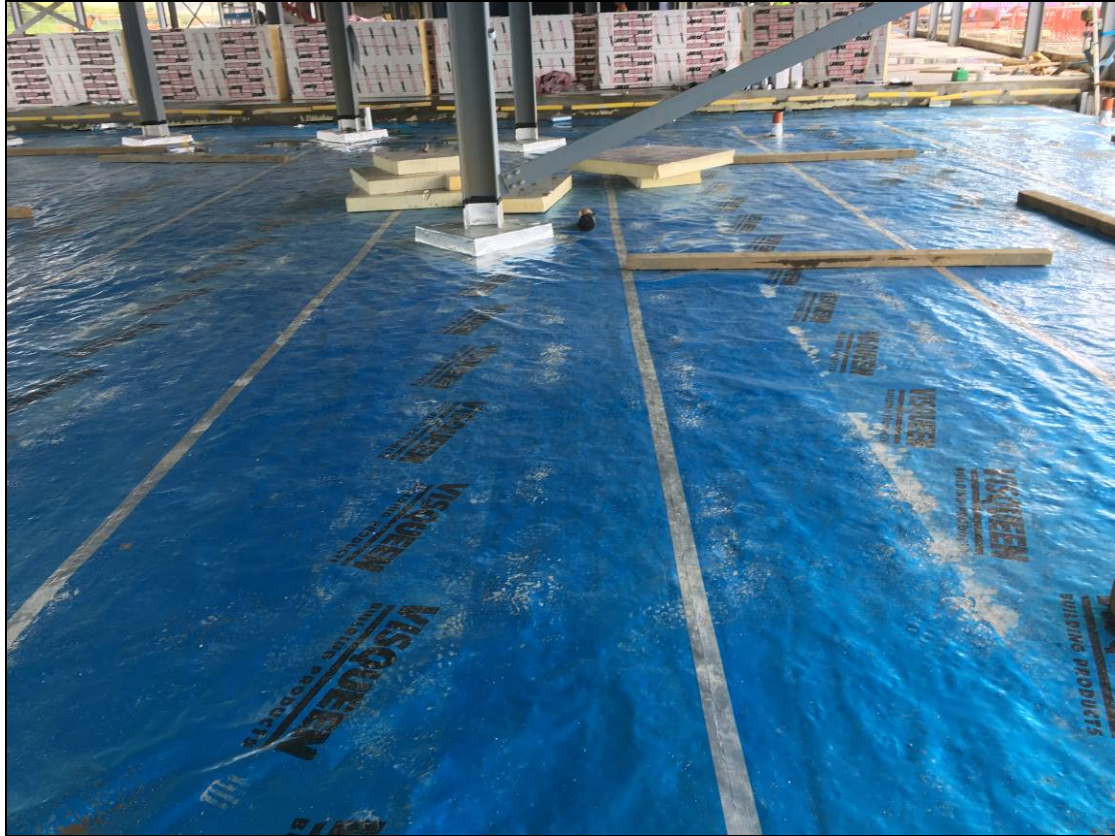


Plate 22 Column Detail - (22/05/2020)

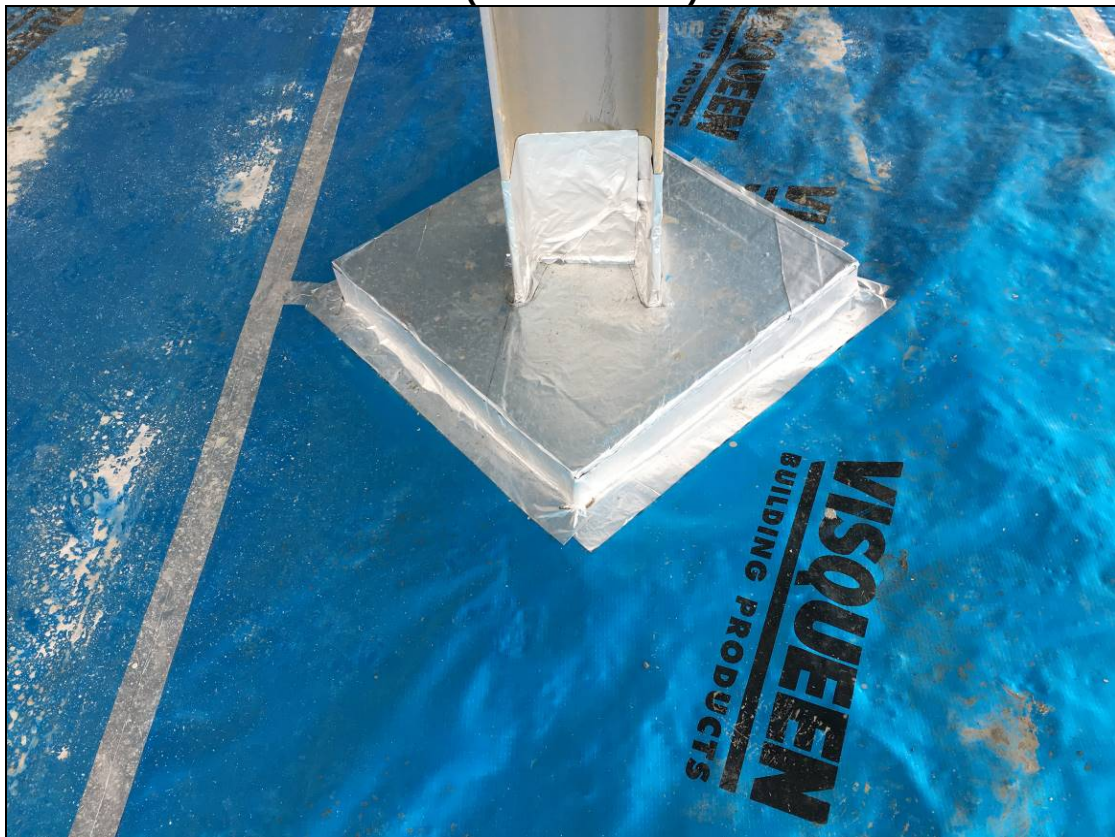


Plate 23 Sealed Penetrations - (22/05/2020)



Plate 24 Membrane - (29/05/2020)



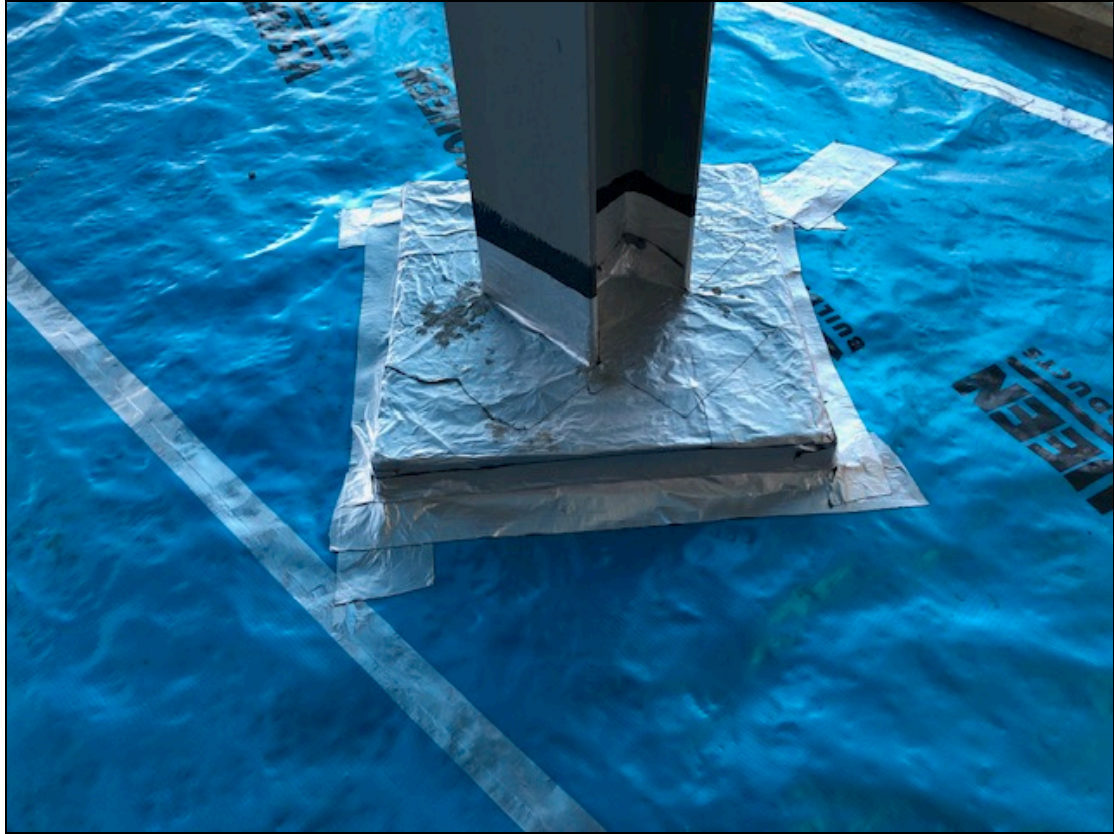
Plate 25 Membrane - (29/05/2020)



Plate26 Sealed Penetrations - (29/05/2020)



Plate 27 Column Detail - (29/05/2020)





APPENDIX III

SITE INSPECTION SHEETS

GAS PROTECTION MEASURES VALIDATION AND VERIFICATION TEST REPORT

Project Name: Cefn Sion School, Cyma
 Project No. 072-20-541
 Inspection carried out by: P.W.

Plot(s): Phase 1 A. CSports Hall

Date:

Reason for Gas Protection (if known): CO₂.

Level of Gas Protection Required or Gas Protection to be Validated: CS2

Installer: Ian Thomas Construction

Gas Membrane Product: Visqueen Gas Barrier

Gas Membrane Condition: Good

Joints Double Taped or Welded: Double Sided Tape + Lap Tape

Penetrations Sealed: Yes/No N/A - Columns Sealed.

Repairs required?: Yes/No Patches needed + some re-sealing

Ventilation Installed: Yes/No

Type of Ventilation: N/A

Vent Spacing: N/A

Membrane Installed across Cavity: Yes No Not Seen N/A

Integrity Testing required: Yes/No

Air Lance Testing: Yes/No

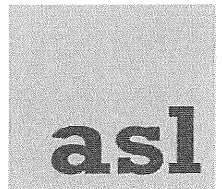
Tracer Gas Testing: Yes/No

General Comments: Membrane generally good. Some Seals on side need repair re-seal using SAGM. OK.

Verifier Signature: B.M. W. Thomas

Installer Representative: Name: W. Thomas Signed: W. Thomas Company: ITC

Site Representative: Name: Signed: Company:



GAS PROTECTION MEASURES VALIDATION AND VERIFICATION TEST REPORT

Project Name: Cefn School, Afan Valley Road, Cyma
 Project No. 072-20-541
 Inspection carried out by: ST

Plot(s): 6L-20-22A Sport Hall

Date: 12/3/20

Reason for Gas Protection (if known):
CO₂

Level of Gas Protection Required or Gas Protection to be Validated:
CO₂

Installer	<u>Ian Thomas Contractor</u>				
Gas Membrane Product	<u>Visqueen Gas Barrier</u>				
Gas Membrane Condition	<u>Good</u>				
Joints Double Taped or Welded	<u>Double sided tape + Laptape</u>				
Penetrations Sealed	☒ Yes ☒ No <u>NA Columns sealed.</u>				
Repairs required?	☒ Yes ☒ No <u>Some resealing</u>				
Ventilation Installed	☒ Yes ☒ No				
Type of Ventilation	<u>N/A</u>				
Vent Spacing	<u>N/A</u>				
Membrane Installed across Cavity	<table border="0" style="width: 100%;"> <tr> <td style="text-align: center;">Yes</td> <td style="text-align: center;">No</td> <td style="text-align: center;">Not Seen</td> <td style="text-align: center;">N/A</td> </tr> </table>	Yes	No	Not Seen	N/A
Yes	No	Not Seen	N/A		
Integrity Testing required	☒ Yes ☒ No				
Air Lance Testing	☒ Yes ☒ No				
Tracer Gas Testing	☒ Yes ☒ No				

General Comments:
Membrane in good condition some seals needed minor repairs.
Repaired using detail tape and SAGM

Verifier Signature ST

Installer Representative Name [Signature] Signed [Signature] Company [Signature]

Site Representative Name W. Thomas Signed W. Thomas Company [Signature]

GAS PROTECTION MEASURES VALIDATION AND VERIFICATION TEST REPORT

Project Name: CEFN SEASON SCH.

Project No. 072-20-541

Inspection carried out by: CES

Plot(s): CONC POUR. PHASE 2A

Date: 8/4/20

Reason for Gas Protection (if known): CO₂

Level of Gas Protection Required or Gas Protection to be Validated: CS2

Installer: IAN THOMAS CONSTRUCTION

Gas Membrane Product: VISOSEEN GAS BARRIER, DS TAPE + LAP TAPE.

Gas Membrane Condition: V. GOOD

Joints Double Taped or Welded: TAPED

Penetrations Sealed: ☒ Yes / ☐ No

Repairs required?: ☒ Yes / ☐ No

Ventilation Installed: ☒ Yes / ☐ No

Type of Ventilation: -

Vent Spacing: -

Membrane Installed across Cavity: Yes No Not Seen ☒ N/A

Integrity Testing required: Yes ☒ No

Air Lance Testing: Yes ☒ No

Tracer Gas Testing: Yes ☒ No

General Comments: GOOD WORKMANSHIP, REPAIRS CARRIED OUT WHERE REQUIRED?

Verifier Signature: O.R.

Installer Representative Name: Signed: Company:

Site Representative Name: Signed: Company:

Unable to
sign due
to Covid-19

GAS PROTECTION MEASURES VALIDATION AND VERIFICATION TEST REPORT

Project Name:	CEFN SCHOOL
Project No.	072-20-541
Inspection carried out by:	MRCD

Plot(s):	PHASE 3 - MAIN MEMBRANE LAYOUT
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Date:	22/4/20
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Reason for Gas Protection (if known):	CO ₂
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Level of Gas Protection Required or Gas Protection to be Validated:	CS2.
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Installer	Ian Thomas Construction		
Gas Membrane Product	Visqueen Gas Barrier		
Gas Membrane Condition	GOOD - EDGES DAMAGED BY OTHER WORKS + NEED REPAIR		
Joints Double Taped or Welded	TAPED		
Penetrations Sealed	☒ Yes ☐ No		
Repairs required?	☒ Yes ☐ No MINOR		
Ventilation Installed	☒ Yes ☐ No N/A.		
Type of Ventilation	N/A.		
Vent Spacing	N/A		
Membrane Installed across Cavity	Yes	No	☒ Not Seen TO BE COMPLETED LATER
Integrity Testing required	Yes ☒ No		
Air Lance Testing	Yes ☒ No		
Tracer Gas Testing	Yes ☒ No		

General Comments:	REMAINING COLUMNS TO BE TAPED AND DETAIL PROVIDED BY PHOTOS. MINOR REPAIRS ONLY. JUNCTION WITH PHASE 2 NEEDS REPAIRS. TO BE PROVIDED BY PHOTOS
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Verifier Signature	MRCD		
Installer Representative	Name: GAVIN CRISP	Signed:	Company: FORMFIX
Site Representative	Name: IAN THOMAS	Signed:	Company: IAN THOMAS CONSTRUCTION

GAS PROTECTION MEASURES VALIDATION AND VERIFICATION TEST REPORT

Project Name: CEFN SEASON SCHOOL

Project No. 072-20-541

Inspection carried out by: SES.

Plot(s): PHASE 4 - House 1

Date: 12/5/20

Reason for Gas Protection (if known):
CO₂

Level of Gas Protection Required or Gas Protection to be Validated:
CS2

Installer IAN THOMAS CONSTRUCTION

Gas Membrane Product VIRQUEEN GAS BARRIER + DS TAPB, LAD TAPB + SAGRM

Gas Membrane Condition V. GOOD

Joints Double Taped or Welded DOUBLE TAPED

Penetrations Sealed Yes/No

Repairs required? Yes/No

Ventilation Installed Yes/No

Type of Ventilation

Vent Spacing

Membrane Installed across Cavity

Yes	No	Not Seen	<u>N/A</u>
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Integrity Testing required

Yes/No

Air Lance Testing

Yes/No

Tracer Gas Testing

Yes/No

General Comments:
Generally v. good workmanship. A few minor repairs required (a few holes, resealing of top hats + sealing around stanchions).

Verifier Signature S. [Signature]

Installer Representative Name [Signature] Signed [Signature] Company [Signature]

Site Representative Name IAN THOMAS Signed [Signature] Company IAN THOMAS CONSTRUCTION

GAS PROTECTION MEASURES VALIDATION AND VERIFICATION TEST REPORT

Project Name: CEFL SEASON SCHOOL.

Project No. 072-20-541

Inspection carried out by: SES.

Plot(s): PHASE 4 - POUCE 2

Date: 22/5/2020

Reason for Gas Protection (if known):
CO₂

Level of Gas Protection Required or Gas Protection to be Validated:
CS2

Installer	<u>IAN THOMAS CONSTRUCTION.</u>
Gas Membrane Product	<u>VISCQUEEN GAS BARRIER, DS TAPE, LAP TAPE + SAGM.</u>
Gas Membrane Condition	<u>V. GOOD.</u>
Joints Double Taped or Welded	<u>DOUBLE TAPED.</u>
Penetrations Sealed	☒ Yes/ ☐ No
Repairs required?	☒ Yes/ ☐ No
Ventilation Installed	☒ Yes/ ☐ No
Type of Ventilation	<u>N/A</u>
Vent Spacing	<u>N/A</u>
Membrane Installed across Cavity	Yes No Not Seen ☒ N/A
Integrity Testing required	☐ Yes/ ☒ No
Air Lance Testing	☐ Yes/ ☒ No
Tracer Gas Testing	☐ Yes/ ☒ No

General Comments: Membrane installation v good. Repairs required to a number stanchions and a few minor holes. Steel cages installed around perimeter with localised associated repairs required.

Verifier Signature S.F.

Installer Representative Name BOBBY Signed [Signature] Company IAN THOMAS CONSTRUCTION

Site Representative Name WYN THOMAS Signed [Signature] Company IAN THOMAS CONSTRUCTION

GAS PROTECTION MEASURES VALIDATION AND VERIFICATION TEST REPORT

Project Name:	CEFN SEASAN SCHOOL
Project No.	072-20-541
Inspection carried out by:	MR AD
Plot(s):	
Date:	29/5/20
Reason for Gas Protection (if known):	CO ₂
Level of Gas Protection Required or Gas Protection to be Validated:	CS2

Installer	IAN THOMAS CONSTRUCTION		
Gas Membrane Product	VISQUEEN GAS BARRIER SYSTEM SACIM		
Gas Membrane Condition	V. GOOD.		
Joints Double Taped or Welded	TAPED		
Penetrations Sealed	☒ Yes/No		
Repairs required?	☒ Yes/No ONE ONLY - ALL COMPLETE		
Ventilation Installed	Yes/No NA		
Type of Ventilation	-		
Vent Spacing	-		
Membrane Installed across Cavity	Yes	No	Not Seen ☒ N/A
Integrity Testing required	Yes/No ☒		
Air Lance Testing	Yes/No ☒		
Tracer Gas Testing	Yes/No ☒		

General Comments:	NO ISSUES. MEMBRANE IN GOOD CONDITION.
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Verifier Signature	MR AD		
Installer Representative	Name: WYN THOMAS	Signed: NOT SIGNED DUE TO COVID-19 PROTOCOLS	Company: IAN THOMAS CONSTRUCTION
Site Representative	Name:	Signed:	Company: