



GeoEnginSeer

FREELANCE DILETTANTE GEOLOGIST

**Oakroyd Hall,
Birkenshaw,
Bradford Road BD11 2DY**

Verification Completion Report for Ground Gas Protection Systems

Date / Time:	02.04.24 9000hrs
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Project Title	Oakroyd Hall Birkenshaw
GES Report Number	1513
Date	09.05.24
Client	GRK Civils / Willmott Dixon
Weather	9oC cloudy, light wind 3 kmph
Development Type	Commercial
Foundation Type	Sectional concrete slab floors
Area / section	Training area – Tunnels Visit 2 (second half of install)
GES Job Ref:	1427
Visit By	Paul Carter – Jones

Report By	Checked/Approved By
<i>Signature</i>	<i>Signature</i>
<i>Name:</i> Paul Carter – Jones	<i>Name:</i> Ben Crowther

Company Contact Details

**Oakroyd Hall,
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1. GAS MEMBRANE

1.1 Condition Of Subgrade and Underside Of Gas Membrane

Check that the subgrade does not contain rough/uneven surfaces, is appropriately clean and that there are no hard/sharp objects. That protective sand blinding or geotextile (if specified) is present and meets the design criteria.

The subgrade was Cast Monolithic reinforced slab which has been cleaned and scraped for a surface smooth enough for the install.

1.2 Gas Membrane Type

Manufacturer and product specification, gauge, colour, brand/name, material batch/roll numbers.

Juta GP Titan Bond, preformed corners and sheet material with tanking primer and double sided jointing tape for temporary fixing (also wired at top in excess sheet).

1.3 Laps, Welds and Joint Seals

Joints lapped and sealed in accordance with manufacturers requirements/specification. Minimum overlap insured? Welds complete? Appropriate joining/double sided tape used?

The membrane had been heat welded together.

1.4 Service Entries Seals

How many pipe penetrations? Top hats seal arrangements fixed around service entries? Use of jubilee clips? Etc.

NA

2. VENTILATION SYSTEMS

2.1 Subfloor Void

Is a check possible? Void former? Gravel (type/specification)? Height of void space? Is it clear?

N/A

2.2 External Wall Airbricks

How many? Size? Positioning? Spacing? Etc.

N/A

2.3 Active Venting

Type of air supply: mechanical, natural, combined? Location/condition/number of fans/vents? Location and size of inlets? Provision of air cleaning devices and air heaters? Supply and exhaust duct work? Alarm provision/installation? Gas monitoring system in under-floor void?

N/A

2.4 Testing Of Air Flow

Is the air flowing sufficiently through ventilation? Anemometer reading? Smoke test? Tracer gas?

N/A

3. INSPECTION AND INTEGRITY DETAILS

On the 2nd of April 2024 the installation of the Proprietary Gas Resistant Membrane for the protection of properties from ground gas was inspected at Oakroyd Hall Birkenshaw, in the Tunnels training area. This was a follow up visit to see the completed installation.

The subgrade appeared to have been cleared and swept to a very good standard, there were no sharp or protruding objects.

Juta GP Titan Bond had been installed on the base, which then returned vertically up and around the perimeter. It had been held in place along the shuttering temporarily with wire ties, these were placed above the pour line in an extra area of membrane overlap, which can be repaired when joined to the rest of the gas membrane on the ground level or trimmed back. It was held to the wall with strips of double-sided tape that had been applied to sections of the wall that had been pre-treated with primer.

The membrane had been installed throughout the central area with a minimum of 100 – 150mm overlap. The seams of the membrane appeared to have been heat sealed together but I couldn't inspect the seams as they had also been covered with an overlaying tape on the upper side as a secondary seal, which was sound.

The corners had been detailed with the Titan Bond membrane cut and shaped to fit that had been bonded with the same over laying tape.

I pick tested and visually inspected all laps and they were well sealed, and the upper tape applied and been installed with a very good bond.

Overall the membrane had been installed to a very neat and good standard. An opening had been left around the temporary stair access, approximately a meter square, that is to be put in place once the stairs have been safely moved.

A Solco Bentobar Water Stop was currently being installed in between the rebar, the method of the installation of this water stop was under discussion with the site team during my visit. It was unclear if the water stop was to be installed with an adhesive or if fixings were to be used.

Please see photographs.

4. PHOTOGRAPHIC RECORDS

Training Tunnels:



Training Tunnels:



Detail tape on back of stair well:



Bentobar Water Stop:



Area to be completed:



Site plan:

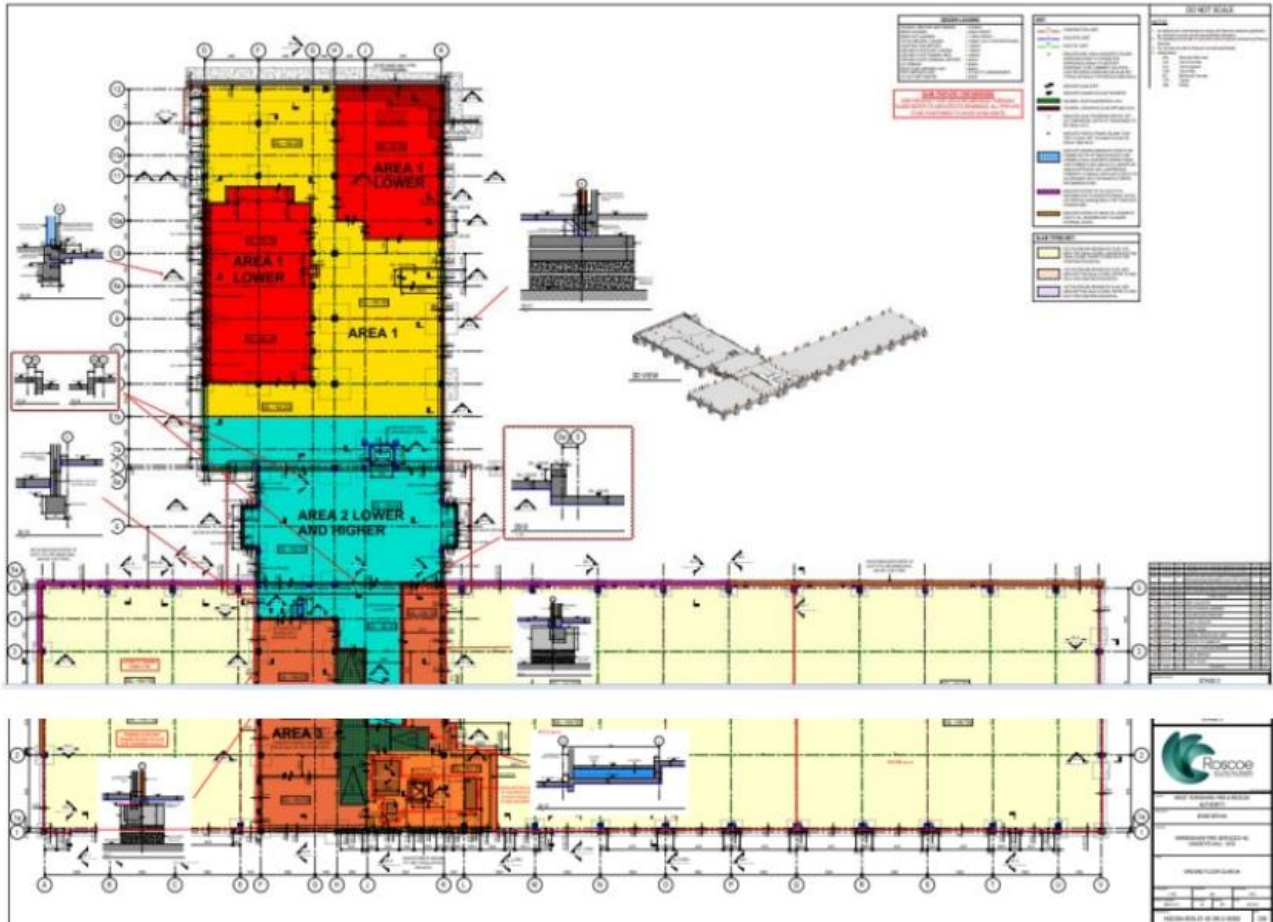


Image split due to size and capacity to fit legibly on on sheet. Please refer to originals.

Product data sheets:



GROUND GAS PROTECTION GP TITANBOND™ TECHNICAL DATA SHEET

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GP TITANBOND™

GP TITANBOND™ is a pre-applied fully bonded waterproofing membrane incorporating the GP TITANFLEX™ membrane and a heavy duty virgin polypropylene geotextile. The geotextile is laminated to the membrane to provide a dual function, protecting the membrane from damage and providing an integrated 'bond' to poured concrete, ensuring a fully bonded waterproofing barrier which has exceptionally high resistance to ground gases and VOCs. GP TITANBOND™ is used for the gas/waterproofing/lining of underground structure where harmful ground gases are anticipated.

Thickness 2.0 mm
Depth 1.8 m
Weight 200 g/m²
Weight 600 g/m²

TITANTECH™ For installation of membrane and associated work, the TITANTECH™ family of membranes requires a major step forward in packaging, project logistics, storage and a formal presentation.


Handling Roll weights can be in excess of 20kg and hence appropriate care and equipment is required for unrolling and handling.

Storage Rolls of GP TITANBOND™ should be stored on stable/level ground and stacked not more than five rolls high, with no other material stacked on top. The rolls can be stored outdoors when protected, but should be protected from exposure to UV.

BBA UK CE UK

Require solutions for High Risk Applications

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GROUND GAS PROTECTION GP TITANBOND™ TECHNICAL DATA SHEET

Feature	Characteristics	Test Method	GP TITANBOND™
Durability and Chemical Resistance	Chemical Resistance - Sulphur Dioxide (SO ₂) 10% Solution of Sulphur Dioxide (SO ₂) 10% For 90 Days	EN 14813-B	Passes without visible signs of failure
	Chemical Resistance - Acetic Acid (Glacial Hydrochloric Saturated Suspension) 10% For 90 Days	EN 14813-B	Passes without visible signs of failure
	Chemical Resistance - Sodium Chloride (Salt) 10% For 90 Days	EN 14813-C	Passes without visible signs of failure
	Chemical Resistance - Sodium Chloride (Salt) 10% For 90 Days	EN 14813-C	Passes without visible signs of failure
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Feature	Characteristics	Test Method	GP TITANBOND™
Physical Properties	Thickness	EN 13201	2.0 mm
	Depth	EN 13201	1.8 m
	Length	EN 13201	20 m
	Weight	EN 13201	200 g/m ²
Hydraulic Properties	Water Vapor Transmission Rate	EN 1208	0.11 - 0.13 g/m ² /day
	Water Uptake (24h)	EN 1928	Pass
	Water Uptake (7 to 14h @ 20 in Water Head) (Equivalent Absorbance)	EN 1928	Pass
Mechanical Properties	Dimensional Stability (cold)	EN 11790-B	< 0.2%
	Puncture Resistance	EN 12126	> 2.0 kN
	Tensile Strength (MD)	EN 12311-1	> 100 N/50mm
	Tensile Strength (CD)	EN 12311-1	> 100 N/50mm
	Tensile Elongation (MD/CD)	EN 12311-2	> 100%
	Tensile Elongation (MD/CD)	EN 12311-2	> 100%
	Resistance Impact	EN 12491-B	> 1 kJ/m ²
	Resistance to Tear	EN 12491-1	> 100 N
	Concrete Top Adhesion	EN 12491-1 (AK-2)	> 0.2 MPa
	Resistance to Mineral Acids	EN 12491-1 (AK-2)	Pass
Resistance to Chlorides	EN 12491-1 (AK-2)	Pass	
Compliance and Certification	CE Mark	EN 12491-1 (AK-2)	
	EN 14883-21 (21 Compliance (Aluminum and Carbon Dioxide System)		
	EN 14883-22 (22 Compliance (CO ₂ System)		
Vapour Permeability (90%) Concentration	Transmission Rate of Benzene	EN 1501-1010-2	< 0.01 m ³ /m ² /day
	Transmission Rate of Chloride	EN 1501-1010-2	< 0.01 m ³ /m ² /day
	Transmission Rate of Hydrogen	EN 1501-1010-2	< 0.01 m ³ /m ² /day
	Transmission Rate of Hydrogen (90%)	EN 1501-1010-2	< 0.01 m ³ /m ² /day
	Transmission Rate of Nitrogen	EN 1501-1010-2	< 0.01 m ³ /m ² /day
	Transmission Rate of Oxygen	EN 1501-1010-2	< 0.01 m ³ /m ² /day
	Transmission Rate of Trichloroethylene (TCE)	EN 1501-1010-2	< 0.01 m ³ /m ² /day
	Transmission Rate of Toluene	EN 1501-1010-2	< 0.01 m ³ /m ² /day
Gas Permeability	Water Vapor Permeability (Combined)	EN 1501-1010-1	< 0.12 m ³ /m ² /day
	Water Vapor Permeability (Combined)	EN 1501-1010-1	< 0.12 m ³ /m ² /day
	Carbon Dioxide Permeability	EN 1501-1010-1	< 0.02 m ³ /m ² /day
	Water Vapor Permeability	EN 1501-1010-1	< 0.02 m ³ /m ² /day



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JUTA UK

Installation
GP TITANBOND™ should be installed in accordance with the product installation guidelines, and in accordance with best practice.

Joining and Sealing
GP TITANBOND™ can be heat welded or taped, with joining carried out by competent personnel with suitable qualifications in accordance with best practice. GP TITANBOND™ should be overlapped by at least 100mm. If taping joints, only suitable tapes suitable for use in conjunction with a substrate shall be recommended. JUTA per formed details, or self adhesive gas membrane are available for sealing around penetrations.

Accessory Products
• GP-GPC • GP-QUOTURE
• GP-TAPE • JUTA 300TT

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5. CONCLUSION OF SITE VISIT

5.1 Details Of Installers

Are the installers suitably qualified / trained? Names of installers / company details?

GRK Civils Ltd

5.2 Pass / Fail?

Are the measures inspected acceptable / NOT acceptable? Do they comply with the specifications? Is attention required to specific issues?

PASS

5.3 Additional notes

Remedial actions to be taken? Re-visit to be arranged?

All Lines of evidence no received.

If you have any questions regarding the above, please do not hesitate to contact me.

Yours sincerely

Ben Crowther B.Sc, M.Sc, PGCE, FGS, CIEH, PCA-QT, SGPV
For and on behalf of GeoEnginSeer Ltd.

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6.0 Limitations and Challenges of Verification Reporting

This report is based on the information that has been made available to us from the client, contractor and architect regarding the site. The conclusions drawn in the report are considered correct although any subsequent additional information or actions may allow refinement of the conclusions. It should be noted that: The report has been prepared under the express instructions and solely for the use of the Client.

The findings of this report represent the professional opinion of experienced Ground Gas System Surveyors. GeoEnginSeerLtd does not provide legal advice and the advice of lawyers may also be required.

All work carried out in preparing this report has utilised and is based upon understanding of current relevant UK standards and codes, technology, and legislation. (BS8485:2015+A1:2019 & CIRIA 735).

Changes in this legislation and guidance may occur at any time in the future and cause any conclusions to become inappropriate or incorrect.

The report is limited to the boundaries identified by the Client on this site and confirmed within this document.

Should additional services be introduced, or service conduits are not sealed or have services provided through them at a later date that are not sealed to the conduit and or gas protection system, a retrospective fit may be required. If a site is left open for prolonged periods following verification or works are conducted that may damage the integrity of the installation by follow on trades repairs may be needed, the standards observed in a positive verification report may be compromised. Intellectual rights to this document may be rescinded.