GeoEnginSeer
FREELANCE DILETTANTE GEOLOGIST

Oakroyd Hall,
Birkenshaw,
Bradford Road BD11 2DY

Verification Completion Report for Ground Gas Protection Systems

Date	20.04.23

Project Title	Oakroyd Hall Birkenshaw
Date	20.04.23
Client	GRK Civils / Willmott Dixon
Weather	Sunny 12oC light wind 5kmh
Development Type	Commercial
Foundation Type	Sectional concrete slab floors
Plot Numbers	Retaining Wall (and base of staircase)
Visit By	Paul Carter – Jones

Report By	**Checked/Approved By**
Signature	*Signature*
Name: PAUL CARTER – JONES	*Name:* *Ben Crowther*

Company Contact Details

Oakroyd Hall,
Birkenshaw,
Bradford Road BD11 2DY

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For and on behalf of geoenginseer.
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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 a pre-poured slab, it was perfectly flat and clear of all debris and pre-coated with two coats of primer.

1.2 Gas Membrane Type

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

Solsheet Self Adhesive Membrane

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 laps of the membrane had been heated down and attached to the previous laid Juta GP Titan Bond.

1.4 Service Entries Seals

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

N/A

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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

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3. INSPECTION AND INTEGRITY DETAILS

On the 20th of April 2023 the installation of the Proprietary Gas Resistant Membrane for the protection of properties from ground gas was inspected at Oakroyd Hall Bikenshaw, on the retaining wall and also a small section of the base of the staircase.

The subgrade was poured slab that had been sufficiently swept and cleaned and precast vertical slabs that had been prepped with two coats of primer.

Solsheet Self Adhesive Membrane had been heat applied on to the retaining wall and toe footing, that joined onto the pre-installed Juta GP Titan Bond. The membrane had overlaps with a minimum of 100 – 150mm. The seams of the membrane had been heated and sealed down. All seams were visually inspected, air lanced at a constant 50psi, measured and pick tested.

Overall the membrane had been installed to a very neat and good standard.

I witnessed part of the footing being covered in protection board. More protection board is to be installed vertically before the back fill.

I also inspected the staircase base which was a single piece of Solsheet Self Adhesive Membrane, with no joins, that [redacted] under wooden s[redacted]t this was very good practice and good forwa[redacted]as in my experience this is a detail that is often overlooked.

Please see photographs.

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4. PHOTOGRAPHIC RECORDS

Retaining Wall:

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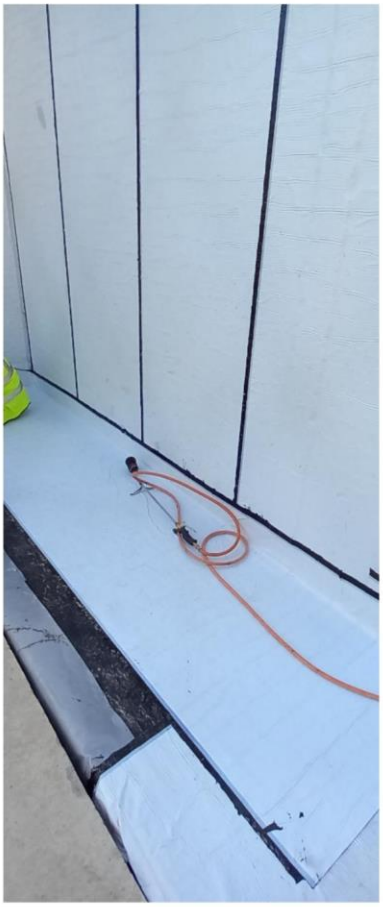

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Staircase base:

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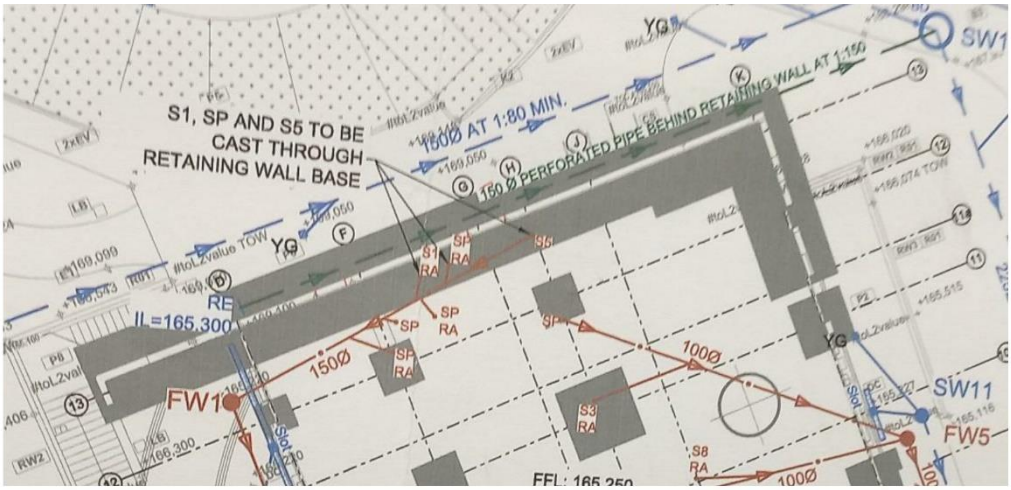

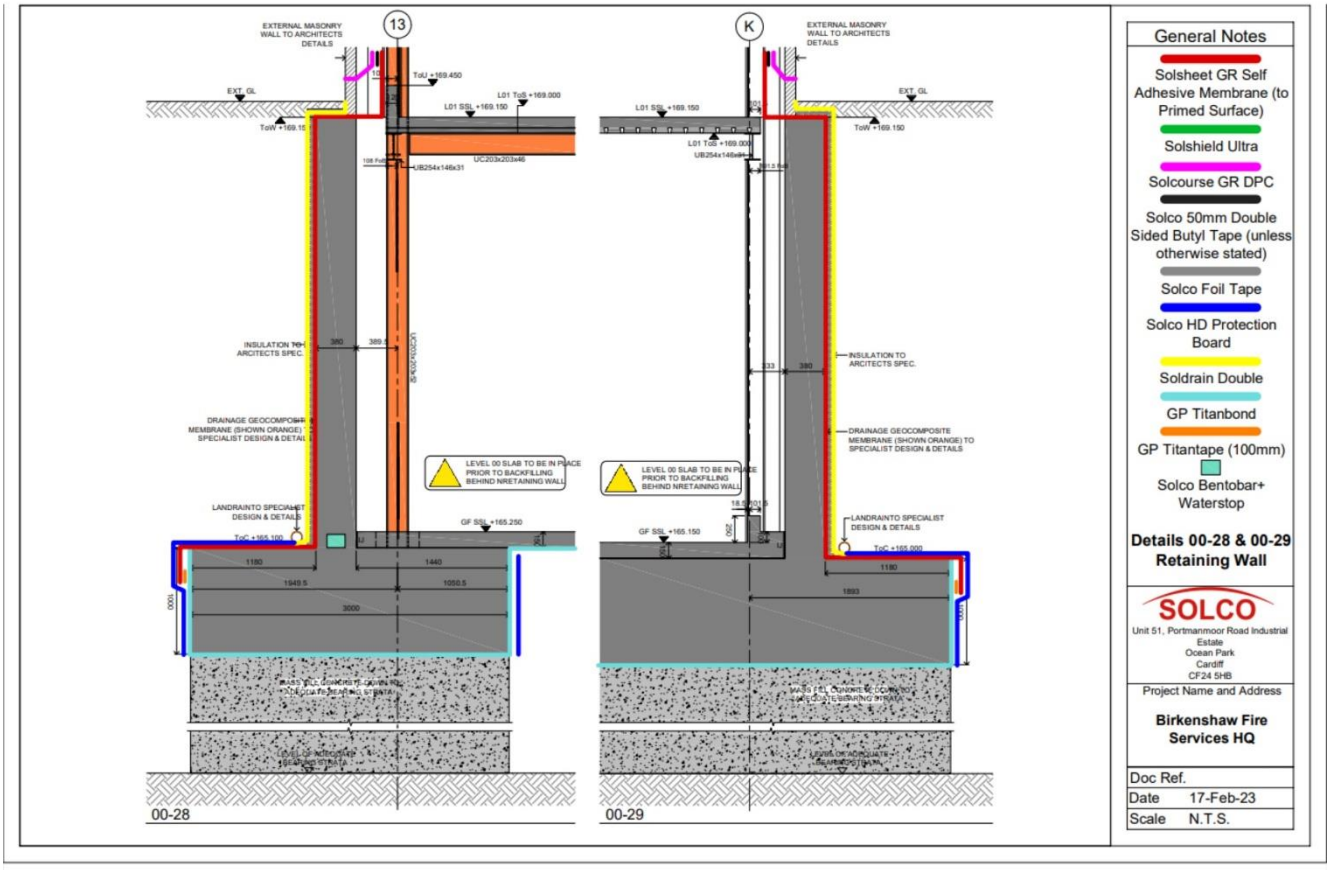

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SOLCO **Technical Datasheet**
Last Issued: November 2022

Solsheet GR Self-Adhesive Membrane

Description:

Solsheet GR Self-Adhesive Membrane is a 1.5mm thick preformed, cold applied, waterproofing system, compatible with concrete, smooth brickwork, and blockwork or screeded substrates and is resistant to those chemicals likely to be present in normal service conditions.

Solsheet GR Self-Adhesive Membrane is manufactured from an aluminium and cross-oriented HDPE film laminated to a layer of rubber modified bitumen adhesive. The advanced backing film suppresses Methane, Carbon Dioxide, and Radon gases. The membrane also offers good conformability for site application.

Solsheet Gas Resistant Self-Adhesive Membrane conforms to the requirements of BS:8485 and BS:8102. Substrates should be primed with Solseal HP Primer prior to application. Solsheet Gas Resistant Self-Adhesive Membrane can be used with Solcourse GR DPC and other Solshield Gas Membranes

- **Roll Dimensions: 1m x 20m (20m²/roll).**
- **Roll Weight: 34kg.**

After installation, the membrane should be covered as soon as possible with a cementitious screed or similar protective layer.

Features:

- Resistant to Rn, CH4, CO2, and Hydrocarbon Vapours.
- Cross-laminated film – provides dimensional stability, high tear strength, puncture, and impact resistance.
- Polymer modified bitumen coating.
- Cold applied – no heating via flames or hot bitumen on site.
- Flexible – will accommodate minor settlement and shrinkage.
- Comprehensive range of accessories and ancillary products.
- Full design and on-site technical support.
- Specification compliant with BS 8102:2009, BS8485:2015+A1:2019, and EN ISO 15105-1.
- CE Marked.
- Non-hazardous and resistant to dilute acids and alkalis.
- Compliant with NHBC Standards.
- Easy Application.
- Provides high-performance protection against the surface and groundwater and soluble salts such as chlorides, sulfates, alkalis, and acids.

Typical Uses:

For general waterproofing where gas protection is required:

- Internal and external tanking of underground structures.
- Land-fill sites and specific geographical locations.
- Car parks and retaining walls.
- Subways and lift shafts.

Substrate Compatibility:

- Wood.
- Brick.
- Concrete.
- Metal.
- Other construction materials.

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Technical Data:

Property	Test Method	Value
Thickness (Total Thickness)	EN 1849-1	1.5mm
Thickness (Backing Thickness)	EN 1849-1	0.1mm
Thickness (Adhesive)	EN 1849-1	1.4mm
Mass per Unit Area	EN 1849-1	1.3 kg/m²
Resistance to Static Load	EN 12730	< 5 kg
Tensile Properties	EN 12311-1	Transverse - 230 N/50mm, 200% Longitudinal - 230 N/50mm, 180%
Watertightness to Liquid Water	EN 1928	Watertight at 2 kPa
Durability of Watertightness (Against Artificial Ageing)	EN 1928	Watertight at 2 kPa
Durability of Watertightness (Against Chemicals)	EN 1928	Watertight at 2 kPa
Resistance to Tear (Nail Shank) (Trans. / Long.)	EN 12310-1	140 N / 150 N
Impact Resistance	EN 12691	200mm
Low Temperature Flexibility	EN 1109	-25°C
Joint Strength	EN 12317-1	Transverse - 160 N Longitudinal - 170 N
Water Vapour Transmission	EN 1931	0.22 g/m²/24hrs
Reaction to Fire	EN 13501-1	Pass
Ignitability	BS EN ISO 11952-2	Pass
Fire Rating	EN 13501-1	E/EFL
Storage Temperature Range		+5°C to 35°C
Application Temperature Range		+5°C to +35°C
Service Temperature Range		-20°C to +80°C
Gas Transmission Rate	ISO 15105-1	CH_4 (single layer and joint): <10 ml/m²/day; CO_2 (single layer and joint): <10 ml/m2/day

Storage:

- The membrane rolls must be stacked on end and stored in dry, well-ventilated buildings, out of direct sunlight, or other major sources of heat.
- Storage conditions should be adjusted before application to bring the temperature of the rolls to within the relevant specified application range.
- The stock should be rotated on a first in/first out basis.
- Solsheet GR Self Adhesive Membrane is classified as non-hazardous (code of practice CP102 1973). The product is chemically inert and any acids or alkalis present in the subsoil will not affect the membrane.
- It is not recommended for use when exposed to sunlight and general outdoor weather conditions for long periods of time. Weathering will not occur when installed.
- Rolls should be stored undercover.
- Quality control during the laying of the membrane is extremely important.
- The membrane should be protected either through the use of temporary boarding over its whole area or the immediate laying of the concrete slab.

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Installation:

Surface Preparation:

- All surfaces should be smooth, clean, and dry. Loosely adhering material and sharp protrusions should be removed by mechanical means.
- Concrete or renders should be allowed to dry before applying Solsheet membranes.

Priming:

All vertical surfaces should be primed using Solseal HP Emulsion/Primer. Horizontal surfaces do not require priming where the membrane is covered with a screed, floor slab, etc. Priming should be carried out as follows:

1. Roll can well before use.
2. Apply at the rate of approximately 2m²/L. Only prime the area which is to be covered with Solsheet within the next 4 hours. Allow to dry for at least 1 hour until touch dry. Keep free from dust.
3. On very porous surfaces, use two coats of primer.

Application:

- Internal angles must always be provided with an adequate sand/cement fillet.
- After priming as previously described a 300mm wide reinforcing strip of Solsheet must be applied with 150mm on either side of the centre of the fillet.
- External angles or corners must be provided with a 25mm x 25mm splay and this covered with a 300mm wide strip of Solsheet, applied equidistant from the centre of the splay.

Horizontal Membrane:

- This should preferably be laid prior to the application of the vertical membrane, adequately protected from damage by a minimum 25mm screed or protection board, with the membrane bonded to the vertical surface at least 200mm above the top of the screed so that the vertical Solsheet can be overlaid.
- If it is not possible to apply the screed over the membrane before the application of the vertical membrane, full and adequate protection must be given to the horizontal membrane to prevent damage.

Vertical Membrane:

- Cut off the appropriate length of membrane, then starting at the top of the area to be waterproofed, peel off at least 200mm of release sheet and bond the Solsheet firmly to the surface, tucking the end of the material into the appropriate DPC or chase.
- Gradually peel off the remainder of the release sheet downwards, at the same time rolling the material against the surface until the bottom of the wall is reached. At the base, the vertical membrane must
- overlap the horizontal membrane by at least 100mm.
- All subsequent sheets must overlap the preceding sheet by 50mm at the edges and by 100mm at ends. Overlaps must be thoroughly rolled to ensure adequate bonding.

Backfilling:

On vertical applications where an abrasive backfill is to be used the Solsheet membrane should be protected by a concrete outer skin, brick skin or Solco HD Protection Board, the latter being held in place by Solco 50mm Butyl tape.

Precautions:

- Solsheet and Solseal HP Primer must not be applied when the surface temperature of the substrate falls below 5°C.
- When a brick-skin is applied to the face of the vertical Solsheet, care must be taken not to damage the membrane and a gap of 40mm should be left, which is filled with sand/cement mortar as work proceeds.
- Only sufficient Solsheet should be laid which can be protected as work proceeds.
- When areas of Solsheet are left exposed for any length of time ensure that all edges are held in place by battens.

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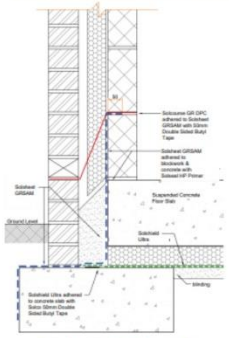
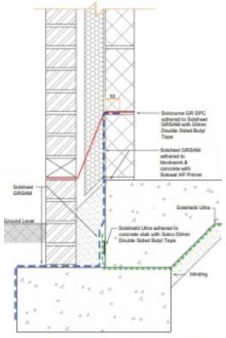
Solsheet GRSAM System Accessories		
Solseal HP Primer	A quick drying primer that promotes the adhesion of self-adhesive membranes. Used prior to the application of Solsheet Membranes.	Tubs
Solco HD Protection Board	A tough, reinforced flexible board, used to protect waterproofing membranes against damage by abrasive backfill materials and poured concrete.	Sheets
Solco Protection Fleece	Protects Solco membranes against mechanical or chemical damage. Can be used as a separating layer between membranes and overlying components.	Rolls
Solco XL Jointing Tape	A self-adhesive tape used for securing waterproofing membranes at overlaps edge and corner details.	Rolls
Solco Foil Tape	A single-sided tape for securing laps & joints.	Rolls
Solco Double Sided Butyl Tape	A double-sided synthetic butyl mastic tape, used for bonding waterproofing membranes. Also used for bonding SA membranes to DPCs and fixing other accessories.	Rolls
Solco Top Hats	Form an effective seal where a pipe, duct, or service penetrates Solsheet membranes.	Units



Typical Slab Edge Detail (Suspended) Standard Construction



Typical Slab Edge Detail (Ground Bearing) Standard Construction

Please contact our Technical department for project specific application details

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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

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?

N/A

NAME	SIGNATURE	DATE
Ben Crowther		25.4.23

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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.

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