Geotechnical & Environmental Consultants

Our ref: D41072/MV5/CEH

18th August 2023

Ashwood Homes
Gateway Business Park
1 Goodison Road
Spalding
PE12 6FY

For the attention of Gavin Baxter

Dear Gavin

Re: High Road, Weston (Membrane Validation Works – Plots 22, 23, 26 to 30, 43, 44, 48 and 49)

Further to your instruction to undertake inspection/verification works following the installation of the ground gas resistant membranes at the above site, we can now make the following comments with regards to Plots 22, 23, 26 to 30, 43, 44, 48 and 49.

PREVIOUS WORKS

The following reports were previously prepared for the site:

- GeoDyne report *'High Road, Weston – Combined Phase I Desk Study and Phase II Exploratory Investigation For Ashwood Homes'* referenced D41072, dated 30th July 2021, Version 1.1.
- GeoDyne report *'High Road, Weston – Ground Gas Verification Plan For Ashwood Homes'* referenced D41072, dated 1st August 2022.

We would recommend that the above reports are read in conjunction with this report.

GROUND GAS PROTECTION MEASURES

The Ground Gas Verification Plan (GGVP) was prepared in general accordance with the requirements of CIRIA C735 '*Good practice on the testing and verification of protection systems for buildings against hazardous ground gases*' (2014) and BS8485:2015+A1:2019 '*Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings*'. The GGVP provides a summary of the ground gas risk assessment, together with the details of the proposed gas mitigation measures and the level of verification required following installation works on site. As stated above, we would recommend that the GGVP is read in conjunction with this report.

The results of ground gas monitoring and assessment undertaken by GeoDyne were detailed in our previous Combined report and revealed that the site should be classified as Characteristic Situation CS2 in accordance with Table 4 of BS8485.

In accordance with Table 7 of BS8485, ground gas mitigation measures should be included within the proposed dwellings to achieve a theoretical 'score' of 3.5 points.

We understand that Plots 22, 23, 26 to 30, 43, 44, 48 and 49 have been constructed with traditional foundations and the points score for these plots can be achieved by the incorporation of venting of a clear subfloor void (1.5 points) together with the inclusion of a gas resistant membrane (2 points). The ground gas protection measures are shown on the Ashwood Homes Gas Membrane Details drawing, included within the GGVP.

MEMBRANE SPECIFICATION & INSTALLATION

In variation to the membrane installer detailed within the GGVP, an alternative membrane installer, UK Membranes Limited, was employed by the groundworkers to install the membranes in Plots 22, 23, 26 to 30, 43, 44, 48 and 49. The membrane installed within these plots comprised Powerbase Multigas 500. We have been forwarded a copy of the UK Membranes Limited Method Statement, a copy of which is included within Appendix I, together with the datasheet and BBA Certificate for the Multigas 500 membrane.

The Multigas 500 membrane is a multilayer reinforced LDPE membrane and it is indicated to have a methane transmission rate of 0.041ml/m^2/day/atm based on ISO15105-1 certification, which satisfies the methane transmission rate criteria within BS8485:2015.

The membranes in Plots 22, 23, 26 to 30, 43, 44, 48 and 49 were installed by a single stage 'total lineout' approach.

During the membrane installation process, corner details were formed using a compatible Self-Adhesive Gas Resistant Membrane (SAGRM) which is a sheet membrane constructed from an Aluminium/Polythene laminate coated with a layer of Self-Adhesive Polymer modified Bitumen. All membrane joints were formed by the installers by a hand welded method (hot air fusion). Service penetrations were sealed to the membrane using bespoke collars formed by the installers on-site from SAGRM.

VALIDATION PROTOCOL – GAS MEMBRANE

The validation protocols for inspection of the gas resistant membrane are detailed within the GGVP and may be summarised as follows:

- Visual inspection of the seams in the membrane to assess the continuity of the membrane throughout the plots, together with mechanical point stress (Pick) tests along the edge of the joint seams and detailing (i.e. corners, service penetrations etc.) to identify any unbonded seams.
- Air lancing should be carried out on all joints and seals around the corners, door entries and service pipe penetrations (to the requirements of ASTM D4437-08:2013).
- Records (including photographs) of any non-compliances (i.e. punctures/tears to the membrane, defective joints/seals etc.) identified during the inspection and corrective action carried out by the installers. Re-inspection of any repairs to the defective areas by the inspecting Engineer.
- For plots which are installed by a two stage 'perimeter and infill approach' the perimeter membrane will not be inspected at the time of installation, the visible and accessible portion of the perimeter membrane will be inspected at the same time as the infill membrane, inclusive of air lancing and a visual inspection of the welded joint between the perimeter and infill membrane.

MEMBRANE INSPECTION/VALIDATION WORKS

Membrane inspections and validation works were carried out at the site by an Engineer from GeoDyne following instruction from Ashwood Homes on the dates listed in Table 1.

Table 1 also confirms the membrane installed, the membrane installers and the installation method within the plots inspected and the status of the membrane validation works for each of the plots reported herein.

TABLE 1 – MEMBRANE VALIDATION SUMMARY					
Plot	Inspection Visit	Membrane Installers	Installation Method	Membrane Installed (Type)	Comment (FAIL/PENDING/PASS)
22	14/08/2023	UK Membranes	Total Lineout	Multigas 500	PASS
23	14/08/2023	UK Membranes	Total Lineout	Multigas 500	PASS
26	29/08/2023	UK Membranes	Total Lineout	Multigas 500	PASS
27	29/08/2023	UK Membranes	Total Lineout	Multigas 500	PASS
28	14/08/2023	UK Membranes	Total Lineout	Multigas 500	PASS
29	14/08/2023	UK Membranes	Total Lineout	Multigas 500	PASS
30	14/08/2023	UK Membranes	Total Lineout	Multigas 500	PASS
43	12/09/2023	UK Membranes	Total Lineout	Multigas 500	PASS
44	12/09/2023	UK Membranes	Total Lineout	Multigas 500	PASS
48	22/11/2022	UK Membranes	Total Lineout	Multigas 500	PASS
49	22/11/2022	UK Membranes	Total Lineout	Multigas 500	PASS
KEY					
PASS	Membrane installation and validation complete				
PENDING	Awaiting membrane installation/validation				
FAIL	Membrane installation unsatisfactory at time of inspection				

Inspection of the membrane was carried out by a combination of visual inspection, pick testing and air lancing. The inspections covered all accessible areas of the membrane, inclusive of joints between membrane panels, corner seals and seals to service penetrations and door thresholds which were accessible and visible to the naked eye was carried out. A record of the membrane installation within the plots was maintained on completed inspection Proformas.

Any defects to the membranes identified during our inspections were repaired by UK Membranes or PJ Towey Groundworkers/Ashwood Homes, in the instances where the UK Membrane installers were not present at the time of our visit. All repairs were made by the application of a SAGRM patch sealed over the defective/damaged area with heat and pressure. All repairs were inspected by the Engineer from GeoDyne during our visits.

We understand that the rear portion of the detached garage structure associated with Plot 43 will comprise habitable space. This portion of the garage has been constructed with cavity walls, a ventilated subfloor void and Multigas 500 membrane has been installed by UK Membranes and inspected by GeoDyne. The remainder of the garage structure has been constructed with single skin walls for use as a domestic garage rather than a habitable space.

Plans & Plates

Plans showing the approximate locations of the defects identified within each of the plots inspected are included in Appendix II (Figure Nos. D41072/MV5/D1 – D41072/MV5/D11). A list summarising the defects identified within the membranes and repairs for each plot (where applicable) is also included on the drawings.

Photographs of the installed membranes together with typical examples of seals to service entry points, corners and a selection of the observed defects and associated repairs are included in Plate Nos. D41072/MV5/P1 – D41072/MV5/P11 included in Appendix III.

SUB-FLOOR VENTILATION

At the time of our inspection visits, the sub-floor voids to Plots 26 to 30, 43, 44, 48 and 49 were not visible as they were covered by the beam and block floor and installed membrane. The Client has confirmed that sub-floor voids have been constructed in accordance with the Drawings included in the Verification Plan. Airbricks were observed within the external walls (on two opposing sides) of each plot during our visit.

During our visit to site on 26th May 2023 the sub-floor voids to Plots 22 and 23 were undergoing construction, with airbricks installed on two opposing sides of each plot. A view of the sub-floor to Plot 22 is included on the Plate No D41072/MV5/P1 in Appendix III.

CONCLUSIONS

Based on our inspections of completed membrane details on the dates detailed in Table 1 we can confirm that the membranes within Plots 22, 23, 26 to 30, 43, 44, 48 and 49 appear to have been appropriately installed in accordance with the GGVP (or taking account of the variations noted herein), which in turn was based on the risk assessment and recommendations made in the previous site investigation reports. The aim of this report is to confirm that the general membrane installation works carried out on site were to a satisfactory standard and will therefore afford the necessary level of protection to future end users of the dwellings.

Upon completion of our visits and 'sign-off' of the membrane in each plot, we understand that the floor screed was poured to provide a permanent protection to the membrane.

With regards to service ducts, the Verification Plan stated that '*It should be borne in mind that where the service penetrations (typically 150mm pipes) are to be used as ducting for smaller service pipes (e.g. water or electricity supply etc.) an appropriate method of sealing the smaller pipes within the ducting should be adopted, (such as closed cell expanding foam) to minimise the risk of the ducting acting as a conduit for ground gases to enter the dwellings*'.

The primary responsibility for the suitable installation of the gas membrane rests with the specialist contractor. GeoDyne's validation works provide an independent third-party check at the time of our visits. We would therefore recommend that certificates of installation are obtained by the Client, to supplement our validation report, from UK Membranes Limited in relation to the installed gas membrane.

Our findings and comments reflect the suitability of the membrane on the days of our visits and are limited to areas completed, physically accessible and visible to the naked eye, together with 'pick' testing and air lancing of visible, accessible welded seams and detailing. No responsibility will be taken for any areas of membrane that could not be inspected or for any damage which occurs to the membranes after our inspections.

CLOSING COMMENTS

It should be noted that this Validation Report relates solely to the ground gas protection measures installed within Plots 22, 23, 26 to 30, 43, 44, 48 and 49. A Validation Tracker for each of the plots is included in Appendix IV. Further Validation Reports relating to the remaining plots should be prepared in due course.

We would recommend that a copy of this letter is forwarded to the Local Authority (by the Client) for comment and approval as part of the planning process for development. A copy of the report should also be forwarded to the warranty provider for the development, for inclusion in their records.

Should there be any questions or queries in relation to the validation works completed to date, please do not hesitate to contact us.

Yours sincerely
For and on behalf of GeoDyne Limited



Clare Houghton
Senior Geo-Environmental Engineer

Encs

Appendix I	UK Membranes Limited Method Statement, Powerbase Multigas 500 Gas Membrane Technical Data Sheet & BBA Certificate
Appendix II	Membrane Validation Plans
Appendix III	Plates
Appendix IV	Validation Tracker
Appendix V	Conditions & Limitations

APPENDIX I

UK Membranes Limited Method Statement,
Powerbase Multigas 500 Gas Membrane Technical Data Sheet & BBA Certificate

METHOD STATEMENT

Project: Ashwood Homes, Spalding

CLIENT: PJ Towey

OPERATION: Gas Membrane Installation

This Method Statement has been read and understood by:

Site Operative Name	Signature
Ross Hammonds	
Gary Taylor	
Jamie Vale	
Chris Egan	
Steven Norris	
Andrew Wale	
Callum Taylor	
Nathan George	
Callum Reid	
Tim King	
Brad Reynolds	
Connor Sharman	
Ben Cook	

Date: 17-11-2022

Issue #1 to: PC. Site Agent for PC. Site Supervisor for UK Membranes Ltd to communicate to all site operatives involved with said tasks.

Document Control

Document reference:	PJTAHS
Date of first issue:	17-11-2022
Status:	For approval
Prepared by:	Chris Egan

Revision

Contents

1.0 Introduction
2.0 Health and safety considerations and precautionary measures
3.0 Operations

Attached
Risk assessments

1.0 Introduction

This method statement has been prepared to describe the procedures used during general contract works

This method statement must be checked against and using all the latest tender issue drawings and information available.

This document should be read and used in conjunction with the current project risk assessments. An indication of approval of this document, from the Client or client's agent (as applicable), will be required prior to commencement of the works described herein.

Prior to project start-up, Company management will decide on the best sequence of works, and any area / phasing to be incorporated into the works programme.

Sequence of Works.

Work to commence on 17-11-22 and is expected to take Multiple days with Multiple Visits.

Operations Manager- Chris Egan 07702540327

This project consists of the installation of gas membrane to the Ashwood Homes project, Spalding. The project will be carried out using Multigas 500 gas membrane, GRSAM and accessories and the use of small handheld tools, none of which require vibration surveillance or noise assessments.

2.0 Health & Safety considerations and precautionary measures

I. UK Membranes Ltd are always committed to the provision of a safe working environment, and to this end undertake to suitably train and advise staff and operatives as befits their role in a project. In addition, the company provides, at no cost to the operative, all such protective material and equipment as is necessary to ensure their safety whilst in the company employ.

II. It is the principal requirement of all contracts that the works and all constituent elements shall comply with the requirements of current health and safety legislation and approved method statements. The details of this statement are supplemental to the articles of current Health and Safety legislation in that they are company specific. However, should there be a conflict of either content or implication, the legislative requirements shall prevail, and site practices would be revised to reflect this. Further or revised statements may be required where such an occasion would involve the incidence of an unassessed risk.

III. This statement shall be issued to operatives and all affected parties to inform and advise of the perceived risks and the prescribed preventative measures to be adopted.

IV. This document will be further communicated to the workforce by means of a toolbox talk and shall be signed by each operative at sheet 2 as acceptance of their knowledge and understanding of the works.

V. When conducting inductions or 'tool-box' talks it is important to ensure that all relevant additional information regarding site or operational restrictions or hazards are suitably relayed to the operatives involved in the works.

VI. It is imperative that all parties are aware of their personal responsibility about their own and others' safety and that they conduct themselves in a manner most likely to fulfil this condition.

VII. The works shall be managed and controlled in such a manner as to minimise or, where possible, eradicate the risk to operatives, interfacing trades or members of the public.

VIII. All supervisors, operatives, appointed persons and plant operators shall be trained and certified in accordance with current legislation. Records of such training shall be maintained. Such records will be updated as further training courses are conducted.

IX. Environmental restrictions shall be adhered to in respect of the management of controlled waste, noise, dust and nuisance. Prior, formal and detailed notices shall be issued where an element of work is anticipated to materially disrupt or affect normal environs.

X. All documentation regarding health and safety, i.e., risk and COSHH assessments, statements etc. are to be retained on site and be always made available for inspection.

XI. Changes and unforeseen circumstances may occur throughout the project. In the event of any significant change, the statement should be reviewed and revised where necessary.

XII. All plant and lifting equipment are to have been inspected prior to delivery and be accompanied by the required documentation. Items are to be confirmed as being suitable for the intended use and site checks will be performed to the manufacturer's/suppliers recommendations.

XIII. Open excavations shall be fenced off using suitable and sufficient barriers if to be left open whilst unattended to minimise the risk of other operatives falling into it.

XIV. Ensure that **all** 110v equipment has an in-date PAT test. Tested every 3 months.

XV. Minimum P.P.E of Hard Hat (BS EN 397), High Visibility vest, Steel capped boots (BS EN 20345), Gloves (BS EN 388 task specific) & Glasses (If site specific) to be always worn.

XVI. All UK Membranes operatives carry a current and valid CSCS pass requirement. SSSTS trained supervisor to be in attendance.

XVII. A minimum 2-man installation team will be on site when required.

XVIII. Scissors are the primary cutting tool and will be stored suitably when not in use. Retractable bladed Stanley blades used and stored appropriately when not in use in conjunction with the task specific BSE EN 20345 gloves.

XIX. Bricks or Blocks will need to be supplied for the aid of keeping the membrane in place and ensuring it does not get damaged by strong winds if left open for long periods of time.

XX. All Membranes works are recommended to be covered within 48hrs of Install. Any prolonged exposure to sunlight, extreme weather conditions etc may result in the membrane not being valid and may result in the membrane having to be reinstalled at an additional cost.

XXI. Hot Works to be issued daily and signed off minimum of 1 hour after work completion. 2 extinguishers to be on hand and specific to materials used.

XXII. Nearest Hospital to be outlined in site induction for note of staff.

XXIII. Any prior health conditions will be made aware to Ashwood Homes site staff prior to commencing on site

XXIV. Emergency contact details provided when operatives are inducted.

XXV. Generators will be used as main power source with suitable plant nappy supplied for running/refuelling

3.0 Operations

This project is for the installation of a specified system stated above to be carried out in accordance with our BS EN ISO 9001:2008 Standard Working Procedures. The Designers Specification and current legislation at the site.

3.1 Site set-up & planning

I. In agreement with the Client, identify site/work area perimeter, and areas for dedicated offices, containers, welfare facilities and material placement.
II. Confirm full issue of construction status drawings have been received.
III. Obtain all available information relating to existing services.
IV. Obtain, check and agree the site setting out control data.
V. Identify service / works coincidence and investigate or isolate where necessary.
VI. First Aid box in site office.
VII. No works to being unless all UK Membranes operatives have been inducted.
VIII. Staff to sign in immediately upon arrival at site and sign out upon leaving.

3.2 Loading / unloading / logistics

I. Identify dedicated pedestrian routes within the works section, and where required, provide a physical barrier from works and plant, using fixed barriers.
Site hours 8;00am to 4.00pm and delivery times to be agreed.
II. A banksman will not be required as materials will be delivered to site prior to work commencing thus eliminating need for lorry edge protection and will be unloaded by site mechanical means with prior arrangements having been made.

3.3 Preparation

I. The area to which the membrane is to be installed must be clean and free from all debris and sharp objects. Stones, steps and protrusions/edges must be of a smooth finish and levelled with the appropriate materials.

II. Where a smooth surface cannot be achieved a protective geotextile membrane can be used prior the placement of the final membrane.
III. All structural works i.e., concrete, brick/block work, cavity fill, and column encasement must be complete prior to the commencement of any placement of the membranes. Once membranes are placed and sealed, these seals cannot be broken.
IV. A test weld will be completed, if required, to find the right temperature and speed for the membrane being used; this will also consider the weather conditions.
V. The test weld will then be cut up and tested by the supervisor on site to make sure the weld is sufficient.

3.4 Placement of membrane

I. The rolls of gas membrane weigh over 20kg and will be carried from the van to the place of work by two or more operatives. Or with mechanical assistance where required/possible.
II. We proposed to use a Perimeter / Infill system on this project.
III. All penertrations will be cut and fabricated in situ and a self-adhesive membrane used for the forming and sealing of corners or any irregular penetrations. (As per standard sealing details).
IV. The first operation will be to check preparation of the perimeter area where membrane is to be laid, all brickwork is to be complete, concrete areas are to be cleaned and primed using a primer where needed.
V. The second operation is to carry out the perimeter detail to the Houses. All corners, Steels, Pipe entries etc will be sealed using the Juta GRSAM.
VI. UK Membranes will then return to complete the infill works when the housing Plots have had their roof installed and is as watertight as it can be possibly made.

The membrane will be placed with an overlap of 100mm to the underside of the perimeter membrane (b) and welded together using a DEM-TEC PRO WEDGE or handheld hot air LIESTER welder. A hot works permit is required for the specified equipment and signed off 1 hour after completed works.

VII. Specific requirements are needed for the sealing of pipes, and these must be adhered to: Pipe entries require a straight pipe, no collars or bends and at least 150mm of pipe protruding through from floor levels.
VIII. Self-Adhesive membranes will be applied to previously primed area where applicable after a 2-hour curing time.
IX. A space of 100mm between adjacent pipe or other obstructions must be achieved to affect a gas tight seal to all pipes. All outside diameter pipe sizes must be provided prior to the commencement of the works.
X. Placement to concrete columns and existing concrete/brick may be primed on the first day of works (If required) with a Bitumen B Primer which

requires a curing period. The main loose lay membrane will then be sealed to the primed areas with a self-adhesive gas membrane.

XI. All joints will be lapped, and the membrane is self adhesive and requires only rolling with a small hand roller.

XII. Where a gas burner may be used for drying of concrete walls a hot works permit will be attained daily and signed off accordingly as with the leister method (see VII)

XIII. In areas that membranes will be exposed for jointing later, the edges should be protected to minimise damage. This is the responsibility of the Principal Contractor to always ensure the protection of the membrane.

3.5 **Repair or damage**

I. The area of damage should be clean and dry. For areas of damage of less than 150mm in diameter an adhesive patch will be cut at least 150mm larger than the damage.

II. Backing paper is peeled from the patch and placed over the damaged area with an even pressure applied to ensure a good seal and adhesion.

III. A membrane patch will be hot air welded using a LIESTER welder for double protection

3.6 Final works

I. At the end of each stage, the site supervisor will inspect works to ensure compliance with drawings, specification, etc.

II. Offer completed works for inspection as required by relevant approval bodies, engineer etc.

III. A hand over certificate will be issued by UK Membranes in accordance with their standard procedures.

3.7 **Additional Points**

I. The site should be ready for UK Membranes Ltd to commence works at the agreed time. Any waiting time will be recorded on a day work sheet by the appointed foreman on site and agreed with the Principal Contractors Site Manager. Charges will apply.

II. On completion of the works and the issuance of the hand over certificate the protection of the membrane becomes the sole responsibility of PJ Towey and UK Membranes Ltd can accept no responsibility for any failure of the membrane due to damage by ‘others.

III. If you need to contact UK Membranes Ltd….

UK Membranes Ltd
Unit 10 Levellers Lane
Eynesbury, St. Neots
Cambs
PE19 2JL
Tel: 01480 219879 E-mail info@ukmembranes.co.uk

POWERBASE® MULTIGAS 500 GAS BARRIER MEMBRANE

PRODUCT DATA | Revision 5.2 | itpltd.com

Powerbase® Multigas Barrier is premium multilayer reinforced LDPE gas barrier membranes for radon, methane and CO_2. It incorporates an aluminium layer that is protected by a separate coating.

PRODUCT	Colour	Weight / Thickness EN 1849-2	Tensile strength EN 12311-1/2	Nail tear resistance EN 12310-1 Newtons	Elongation EN 12311-2 %	Compliance	NHBC gas proction measures	Gas permeability	Temperature range °C	Water vapour resistance	Sizes metres	Roll weight kg	Pallet quantity rolls
GAS BARRIER MEMBRANE													
Powerbase MULTIGAS 500	Silver/Green	370 gsm 0.5mm	MD 370 N/mm XD 347 N/mm	MD 295 XD 341	MD 22 XD 16	BS8485:2015+ A1:2019 CS2 compliant	Green Amber 1 & 2	Methane: 0.041 ml/day/m²/ATM CO_2:0.195 ml/day/m²/ATM EN ISO 15105-1 & ASTM D1434	-40 to +70	0.01gsm/day EN 1931 EN 12572(c)	2.0 x 50	38	33

Installation:
Join on site with hot-air or hot-wedge welding, or with Powerbond Butyl Tape. See separate installation instructions for full details.

Other Powerbase products:
Damp Proof Membranes • Hydrocarbon and Chemical Resistant Barriers

Powerbase® is a registered trademark of Industrial Textiles & Plastics Ltd. E&OE.

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Powerbase® is a registered trademark of Industrial Textiles & Plastics Ltd. E&OE.

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ISOQAR REGISTERED UKAS MANAGEMENT SYSTEMS 0026
Certificate Number 2318

itpltd.com

TRI-GAS MEMBRANE

PRODUCT DATA Revision 5.0

TRI-GAS MEMBRANE is premium multilayer reinforced LDPE gas barrier membranes for radon, methane and CO_2. It incorporates an aluminium layer that is protected by a separate coating.

PRODUCT	Colour	Weight / Thickness EN 1849-2	Tensile strength EN 12311-1/2	Nail tear resistance EN 12310-1 Newtons	Elongation EN 12311-2 %	Compliance	NHBC gas proction measures	Gas permeability	Temperature range °C	Water vapour resistance	Sizes metres	Roll weight kg	Pallet quantity rolls
GAS BARRIER MEMBRANE													
TRI-GAS	Silver/Green	370 gsm	MD 370 N/mm XD 347 N/mm	MD 295 XD 341	MD 22 XD 16	BS8485:2015+ A1:2019	Green Amber 1 & 2	Methane: 0.041 ml/day/m²/ATM CO_2 0.195 ml/day/m²/ATM EN ISO 15105-1 & ASTM D1434	-40 to +70	0.01gsm/day EN 1931 EN 12572(c)	2.0 x 50	38	33

Powerbase® is a registered trademark of Industrial Textiles & Plastics Ltd. E&OE.

ISOQAR REGISTERED UKAS MANAGEMENT SYSTEMS 0026
Certificate Number 2318

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BBA APPROVAL INSPECTION TESTING CERTIFICATION
TECHNICAL APPROVALS FOR CONSTRUCTION

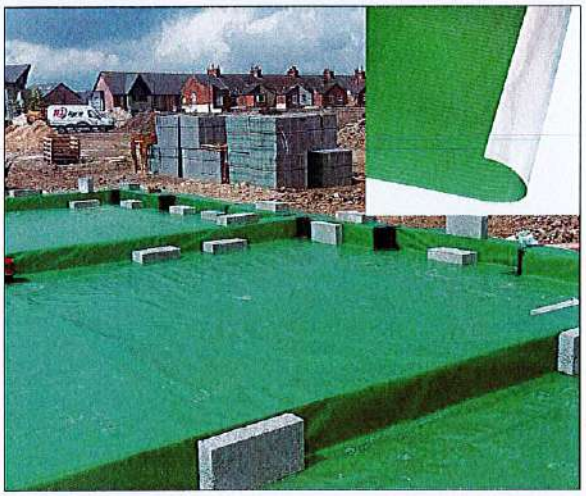
Agrément Certificate
21/5895
Product Sheet 1

INDUSTRIAL TEXTILES AND PLASTICS MEMBRANES

POWERBASE MULTIGAS MEMBRANE MG 500

This Agrément Certificate Product Sheet[1] relates to Powerbase Multigas Membrane MG 500, for use as a low-density polyethylene (LDPE) gas barrier and damp-proof membrane in concrete ground floors, above and below the slab not subject to hydrostatic pressure, to protect the building against moisture, radon, methane and carbon dioxide from the ground.

(1) Hereinafter referred to as 'Certificate'.



CERTIFICATION INCLUDES:

- factors relating to compliance with Building Regulations where applicable
- factors relating to additional non-regulatory information where applicable
- independently verified technical specification
- assessment criteria and technical investigations
- design considerations
- installation guidance
- regular surveillance of production
- formal three-yearly review.

KEY FACTORS ASSESSED

Resistance to water and water vapour — the membrane provides an effective barrier to the passage of liquid water and water vapour from the ground (see section 6).

Resistance to underground gases — the membrane is capable of restricting the ingress of radon, methane and carbon dioxide into the building (see section 7).

Resistance to puncture — the membrane has a high resistance to puncture and on a smooth or blinded surface will not be damaged by foot or site traffic (see section 8).

Durability — under normal service conditions, the membrane will remain effective against the ingress of water and water vapour, and will restrict the ingress of radon, methane and carbon dioxide during the lifetime of the flooring construction in which it is installed (see section 12).

The BBA has awarded this Certificate to the company named above for the product described herein. This product has been assessed by the BBA as being fit for its intended use provided it is installed, used and maintained as set out in this Certificate.

On behalf of the British Board of Agrement

Date of First issue: 30 April 2021

Hardy Giesler
Chief Executive Officer

Certificate amended on 21 March 2022 to remove joint test data and include reference to verification of integrity of the gas membrane when installed.

The BBA is a UKAS accredited certification body – Number 113.
The schedule of the current scope of accreditation for product certification is available in pdf format via the UKAS link on the BBA website at www.bbacerts.co.uk
Readers MUST check the validity and latest issue number of this Agrément Certificate by either referring to the BBA website or contacting the BBA directly.
Any photographs are for illustrative purposes only, do not constitute advice and should not be relied upon.

Regulations

In the opinion of the BBA, Powerbase Multigas Membrane MG 500, if installed, used and maintained in accordance with this Certificate, can satisfy or contribute to satisfying the relevant requirements of the following Building Regulations (the presence of a UK map indicates that the subject is related to the Building Regulations in the region or regions of the UK depicted):



The Building Regulations 2010 (England and Wales) (as amended)

Requirement:	**C1(2)**	**Site preparation and resistance to contaminants**
Comment:		When properly installed in a correctly designed structure, the membrane forms an effective barrier to radon, methane and carbon dioxide, enabling compliance with this Requirement. See section 7.1 of this Certificate.
Requirement:	**C2(a)**	**Resistance to moisture**
Comment:		When properly installed in a correctly designed structure, the membrane forms an effective barrier to the movement of water within the ground floor slab, enabling compliance with this Requirement. See sections 6.1 and 6.2 of this Certificate.
Regulation:	**7(1)**	**Materials and workmanship**
Comment:		The membrane is an acceptable material. See section 12.1 and the *Installation* part of this Certificate.



The Building (Scotland) Regulations 2004 (as amended)

Regulation:	**8(1)**	**Durability, workmanship and fitness of materials**
Comment:		The membrane can contribute to a construction satisfying this Regulation. See section 12.1 and the *Installation* part of this Certificate.
Regulation:	**9**	**Building standards applicable to construction**
Standard:	3.1	Site preparation – harmful and dangerous substances
Standard:	3.2	Site preparation – protection from radon gas
Comment:		The membrane will enable a floor to satisfy the requirements of these Standards, with reference to clauses 3.1.2[(1)(2)], 3.1.6[(1)(2)], 3.1.7[(1)(2)], 3.1.8[(1)(2)], 3.2.1[(2)] and 3.2.2[(1)(2)]. See section 7.1 of this Certificate.
Standard:	3.4	Moisture from the ground
Comment:		When properly installed in a correctly designed structure, the membrane forms an effective barrier to the movement of water within the ground floor slab, enabling compliance with this Standard, with reference to clauses 3.4.2[(1)(2)], 3.4.4[(1)(2)] and 3.4.6[(1)(2)]. See sections 6.1 and 6.2 of this Certificate.
Standard:	7.1(a)	Statement of sustainability
Comment:		The membrane can contribute to meeting the relevant requirements of Regulation 9, Standards 1 to 6 and therefore will contribute to a construction meeting a bronze level of sustainability as defined in this Standard.
Regulation:	**12**	**Building standards applicable to conversions**
Comment:		Comments in relation to the product under Regulation 9, Standards 1 to 6 also apply to this Regulation, with reference to clause 0.12.1[(1)(2)] and Schedule 6[(1)(2)].

(1) Technical Handbook (Domestic).
(2) Technical Handbook (Non-Domestic).

The Building Regulations (Northern Ireland) 2012 (as amended)

Regulation:	**23(a)(i) (iii)(b)(i)**	**Fitness of materials and workmanship**
Comment:		The membrane is acceptable. See section 12.1 and the *Installation* part of this Certificate.
Regulation:	**26**	**Site preparation and resistance to contaminants**
Comment:		When properly installed in a correctly designed structure, the membrane forms an effective barrier to radon, methane and carbon dioxide enabling compliance with this Regulation. See section 7.1 of this Certificate.
Regulation:	**28**	**Resistance to moisture and weather**
Comment:		When properly installed in a correctly designed structure, the membrane forms an effective barrier to the movement of water within the ground floor slab, enabling compliance with this Regulation. See sections 6.1 and 6.2 of this Certificate.

Construction (Design and Management) Regulations 2015
Construction (Design and Management) Regulations (Northern Ireland) 2016

Information in this Certificate may assist the client, designer (including Principal Designer) and contractor (including Principal Contractor) to address their obligations under these Regulations.

See sections: 1 *Description* (1.2) and 3 *Delivery and site handling* (3.1) of this Certificate.

Additional Information

NHBC Standards 2021

In the opinion of the BBA, Powerbase Multigas Membrane MG 500, if installed, used and maintained in accordance with this Certificate, can satisfy or contribute to satisfying the relevant requirements in relation to *NHBC Standards*, Chapters 4.1 *Land quality – managing ground conditions* and 5.1 *Substructure and ground bearing floors.*

CE marking

The Certificate holder has taken the responsibility of CE marking the product, in accordance with harmonised European Standard BS EN 13967 : 2012.

Technical Specification

1 Description

1.1 Powerbase Multigas Membrane MG 500 is a multilayer, LDPE membrane, reinforced with a polypropylene reinforcing grid with an integral aluminium foil.

1.2 The membrane has the following nominal characteristics:

Thickness (mm)	0.6 (including reinforcement scrim)
Effective thickness (mm)	0.4 (measured between the reinforcement scrim)
Roll length (m)	50[1]
Roll width (m)	2[1]
Mass per unit area ($g \cdot m^{-2}$)	370
Tensile strength ($N \cdot 50\ mm^{-1}$)	
Machine direction	≥ 300
Cross direction	≥ 300

Elongation (%)	
Machine direction	≥ 20
Cross direction	≥ 20
Nail tear resistance (N)	
Machine direction	≥ 250
Cross direction	≥ 250
Watertightness (2 kPa)	pass
Colour[2]	
upper surface	Green
lower surface	Silver.

(1) Other sizes available on special order.
(2) Other colours available on special order.

1.3 Ancillary products for use with the membrane include:

- Powerbond double-sided jointing tape — a 30 mm wide butyl tape used to seal overlap joints and penetrations
- Powerbond Foil Tape — a 75 mm wide single-sided tape used in conjunction with Powerbond double-sided jointing tape to secure overlaps
- Powerbond Foil Detailing Tape – a 300 mm wide single-sided foil tape used in conjunction with Powerbond double-sided jointing tape at terminations around penetrations, at corners and other detailing.

1.4 Ancillary products for use with the membrane, but outside the scope of this Certificate, include:

- Top hats — to seal around penetrations through the membrane
- Prefabricated Internal/external corners
- Drainage/gas venting membranes
- Protection membranes/geotextiles
- Gas resistant damp-proof course (dpc).

2 Manufacture

2.1 The membrane is manufactured by an extrusion/coating process.

2.2 As part of the assessment and ongoing surveillance of product quality, the BBA has:

- agreed with the manufacturer the quality control procedures and product testing to be undertaken
- assessed and agreed the quality control operated over batches of incoming materials
- monitored the production process and verified that it is in accordance with the documented process
- evaluated the process for management of nonconformities
- checked that equipment has been properly tested and calibrated
- undertaken to carry out the above measures on a regular basis through a surveillance process, to verify that the specifications and quality control operated by the manufacturer are being maintained.

2.3 The management system of the manufacturer has been assessed and registered as meeting the requirements of EN ISO 9001 : 2015 by BM Trada (Certificate 9325).

3 Delivery and site handling

3.1 Rolls are wrapped in polythene film. Each roll bears a label with the product name and the BBA Logo incorporating the number of this certificate. Rolls are supplied shrink-wrapped on pallets with a maximum of 33 rolls per pallet. Each roll has a nominal weight of 38 kg.

3.2 The rolls should be stored on the original pallet under cover and protected from sunlight and mechanical damage.

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on Powerbase Multigas Membrane MG 500.

Design Considerations

4 Use

4.1 Powerbase Multigas Membrane MG 500 is satisfactory for use as a gas-resistant barrier to restrict the ingress of radon, methane and carbon dioxide into buildings from landfill and naturally occurring sources.

4.2 Buildings in areas of risk should be constructed in accordance with the recommendations of BRE Report BR 211 : 2015 and following the guidance set out in BS 8485 : 2015.

4.3 The membrane is also satisfactory for use as a damp-proof membrane in accordance with CP 102 : 1973 Section 3, BS 8000-0 : 2014 and BS 8000-4 : 1989.

5 Practicability of installation

The membrane is designed to be installed by a competent general builder, or a contractor, experienced with this type of product.

6 Resistance to water and water vapour



6.1 The membrane, including joints, provides an effective barrier to the passage of liquid moisture from the ground.

6.2 The membrane will comply with the minimum sheet thickness for damp proof membranes detailed in the documents supporting the national Building Regulations.

6.3 The membrane is impervious to water and provides a waterproof layer capable of accepting minor structural movements without damage.

7 Resistance to underground gases



7.1 The membrane will restrict the ingress of radon, methane and carbon dioxide into buildings from landfill and naturally occurring sources and satisfy the performance criteria for a gas-resistant membrane as defined in BS 8485 : 2015.

7.2 Measured gas permeability/diffusion values on unjointed membrane are given in Table 1.

Table 1 Gas permeability of Powerbase Multigas Membrane MG 500

Gas	Method	Result
Methane(1)	BS ISO 15105-1	≤ 0.04 $ml \cdot m^2 day^{-1} \cdot atm^{-1}$
Carbon dioxide	BS ISO 15105-1	≤ 0.1 $ml \cdot m^2 day^{-1} \cdot atm^{-1}$

(1) BS 8485 : 2015 requires that the methane transmission measured in accordance with BS ISO 15105-1 : 2007 for a gas-resistant membrane is <40 $ml\,m^{-2}\,d^{-1}\,atm^{-1}$.

7.3 In the opinion of the BBA, the membrane satisfies the criteria for a radon gas resistant membrane of BRE Report BR 211 : 2015.

8 Resistance to puncture

8.1 The membrane can be punctured by sharp objects and care should be taken when handling building materials over the exposed surface.

8.2 Provided there are no sharp objects present on the membrane's surface prior to and during installation of the protective layer, the membrane will not be damaged by normal foot traffic.

9 Compatibility with other materials

The membrane contains an aluminium foil interlayer which may be subject to corrosion by alkaline conditions if damage to the membrane and exposure occurs. However, under normal circumstances, the polyethylene faces of the membrane are compatible with other materials and products typically used in the same areas, with the exception of those containing pitch.

10 Underfloor heating

There will be no adverse effect on the membrane from the underfloor heating under normal service conditions. In other circumstances, the Certificate holder's advice should be sought.

11 Maintenance

As the membrane is confined under concrete and has suitable durability (see section 12), maintenance is not required. However, any damage occurring before enclosure must be repaired (see section 15).

12 Durability



12.1 The membrane will, in normal circumstances, remain effective against the ingress of water and water vapour, and will restrict the ingress of radon, methane and carbon dioxide during the lifetime of the building.

12.2 Long periods of exposure to ultraviolet light will reduce the effectiveness of the membrane.

Installation

13 General

13.1 Powerbase Multigas Membrane MG 500 must be installed and fixed in accordance with this Certificate, the Certificate holder's instructions, the relevant clauses of BRE Report BR 211 : 2015 and the guidance given in BS 8485 : 2015.

13.2 The membrane can be installed in all normal site conditions, provided that the air temperature is not below 5°C to reduce the risk of surface condensation.

14 Procedure

14.1 The membrane must only be applied to surfaces that have a smooth finish, ie they should be free from voids, projections and mortar deposits. Surfaces should be dry and free from dust and frost.

14.2 Concrete surfaces should be dense. Vertical surfaces of brickwork and blockwork must be dry and rendered to provide an even surface. Brickwork or blockwork not rendered must be flush pointed to give a smooth surface without sudden changes in level.

14.3 The membrane is rolled out with the green side uppermost, ensuring that it is properly aligned. All side and end overlaps should be a minimum of 150 mm where taped and prepared in accordance with the Certificate holder's instructions.

14.4 When the membrane is laid below the concrete slab, it should be loose-laid to accommodate any small movements.

14.5 All surfaces must be dried thoroughly prior to joining. Roll edges can be welded or taped by applying a strip of the Powerbond double-sided jointing tape over the membrane with its nearest edge 50 mm from the membrane edge. The protective paper is removed from the tape prior to rolling an adjacent run of the membrane, which must be carefully unrolled over the jointing tape, ensuring a 100 mm overlap. The overlap edge is then secured and protected using Powerbond Foil Tape. Jointed areas should be supported.

14.6 All service penetrations and direction changes should be properly detailed in accordance with the Certificate holder's instructions. Service ducts should be vented to prevent the possibility of gas accumulating in confined spaces.

14.7 The continuity of the gas protection must extend over the footprint of the building, and the membrane must be sealed to a gas-resistant dpc where required.

14.8 The membrane installation should be subject to third-party independent validation, in accordance with BS 8485 : 2015 as detailed in CIRIA C735 section 3.4. Particular attention should be paid to laps, edges and sealing of service entries and penetrations such as pipes and pile caps.

14.9 The membrane should be covered by a screed or other protective layer as soon as possible after installation.

15 Repair

Any damage to the membrane must be repaired using a patch of the membrane, and laps welded or sealed with Powerbond double sided tape and edges secured with Powerbond foil tape. All patched areas must extend a minimum of 100 mm from the damaged area. If required by the local authority, repair work should be confirmed by an independent validation report, as all gas membrane installations should be subject to third-party validation in accordance with BS 8485 : 2015 as detailed in CIRIA C735 section 3.4.

Technical Investigations

16 Tests

16.1 Tests were carried out to determine:

- tensile strength and elongation
- foldability at low temperature
- width, flatness and straightness
- thickness and mass per unit area
- resistance to impact
- dimensional stability
- water vapour transmission
- watertightness (2 kPa)
- shear strength of welded joints
- resistance to static loading
- visible defects.

to assess:

- membrane characteristics
- durability of the membrane and joints.

16.2 An assessment was made of independent test data to BS EN 13967 : 2012 in relation to:

- watertightness
- resistance to impact (hard and soft supports)
- resistance to static loading
- resistance to tearing (nail shank)
- watertightness after ageing and exposure to chemicals (calcium hydroxide)
- water vapour transmission.

17 Investigations

17.1 An evaluation was made of the results of the test data regarding permeability of methane and carbon dioxide.

17.2 The manufacturing process was evaluated, including the methods adopted for quality control, and details were obtained of the quality and composition of the materials used.

Bibliography

BRE Report BR 211 : 2015 *Radon : Guidance on protective measures for new buildings*

BS 8000-0 : 2014 *Workmanship on construction sites — Introduction and general principles*
BS 8000-4 : 1989 *Workmanship on building sites — Code of practice for waterproofing*

BS 8485 : 2015 + A1 : 2019 *Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings*

BS EN 13967 : 2012 + A1 : 2017 *Flexible sheets for waterproofing — Plastic and rubber damp proof sheets including plastic and rubber basement tanking sheet — Definitions and characteristics*

EN ISO 9001 : 2015 *Quality management systems — Requirements*

BS ISO 15105-1 : 2007 *Plastics. Film and sheeting — Determination of gas-transmission rate — Differential-pressure methods*

CP 102 : 1973 *Code of practice for protection of buildings against water from the ground*

18 Conditions

18.1 This Certificate:

- relates only to the product/system that is named and described on the front page
- is issued only to the company, firm, organisation or person named on the front page – no other company, firm, organisation or person may hold or claim that this Certificate has been issued to them
- is valid only within the UK
- has to be read, considered and used as a whole document – it may be misleading and will be incomplete to be selective
- is copyright of the BBA
- is subject to English Law.

18.2 Publications, documents, specifications, legislation, regulations, standards and the like referenced in this Certificate are those that were current and/or deemed relevant by the BBA at the date of issue or reissue of this Certificate.

18.3 This Certificate will remain valid for an unlimited period provided that the product/system and its manufacture and/or fabrication, including all related and relevant parts and processes thereof:

- are maintained at or above the levels which have been assessed and found to be satisfactory by the BBA
- continue to be checked as and when deemed appropriate by the BBA under arrangements that it will determine
- are reviewed by the BBA as and when it considers appropriate.

18.4 The BBA has used due skill, care and diligence in preparing this Certificate, but no warranty is provided.

18.5 In issuing this Certificate the BBA is not responsible and is excluded from any liability to any company, firm, organisation or person, for any matters arising directly or indirectly from:

- the presence or absence of any patent, intellectual property or similar rights subsisting in the product/system or any other product/system
- the right of the Certificate holder to manufacture, supply, install, maintain or market the product/system
- actual installations of the product/system, including their nature, design, methods, performance, workmanship and maintenance
- any works and constructions in which the product/system is installed, including their nature, design, methods, performance, workmanship and maintenance
- any loss or damage, including personal injury, howsoever caused by the product/system, including its manufacture, supply, installation, use, maintenance and removal
- any claims by the manufacturer relating to CE marking.

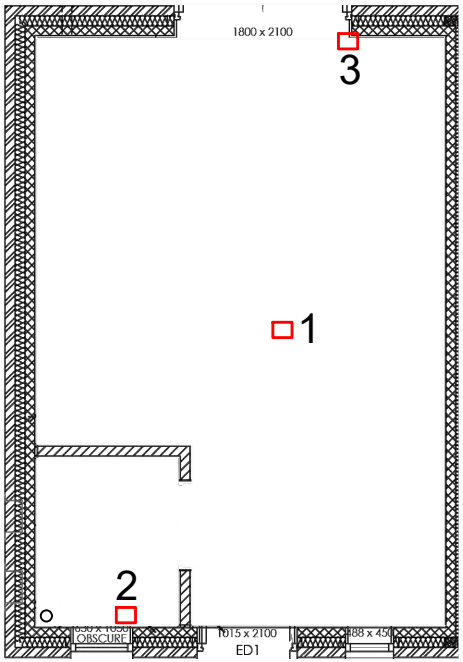
18.6 Any information relating to the manufacture, supply, installation, use, maintenance and removal of this product/system which is contained or referred to in this Certificate is the minimum required to be met when the product/system is manufactured, supplied, installed, used, maintained and removed. It does not purport in any way to restate the requirements of the Health and Safety at Work etc. Act 1974, or of any other statutory, common law or other duty which may exist at the date of issue or reissue of this Certificate; nor is conformity with such information to be taken as satisfying the requirements of the 1974 Act or of any statutory, common law or other duty of care.

APPENDIX II

Membrane Validation Plans
(Figure Nos. D41072/MV5/D1 – D41072/MV5/D11)

KEY

- Service Penetration
- Validated Repair



SUMMARY OF DEFECTS				
Defect No.	**Date of Inspection**	**Description**	**Repair**	**Date of Reinspection**
1	14/08/2023	Puncture	SAGRM patch (heat sealed)	14/08/2023
2	14/08/2023	Incomplete weld on service penetration seal	SAGRM patch (heat sealed)	14/08/2023
3	14/08/2023	Incomplete weld on corner seal	SAGRM patch (heat sealed)	14/08/2023

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Project No.	D41072
Client	Ashwood Homes
Project	High Road, Weston
Title	Membrane Validation of Plot 22
Drawn By	SJ
Checked By	CEH
Approved By	RS
Scale	NTS
Date Drawn	14/09/2023
Revision	
Figure No.	D41072/MV5/D1

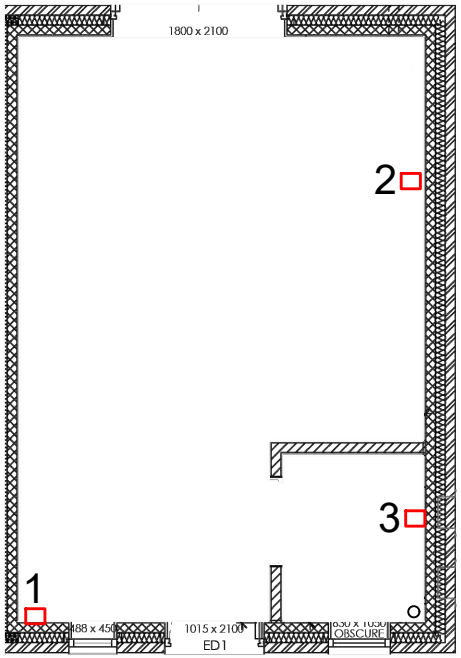
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KEY

- Service Penetration
- Validated Repair



SUMMARY OF DEFECTS

Defect No.	Date of Inspection	Description	Repair	Date of Reinspection
1	14/08/2023	Incomplete weld on corner seal	SAGRM patch (heat sealed)	14/08/2023
2	14/08/2023	Incomplete weld on service penetration seal	SAGRM patch (heat sealed)	14/08/2023
3	14/08/2023	Incomplete weld on service penetration seal	SAGRM patch (heat sealed)	14/08/2023

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Project No.	D41072
Client	Ashwood Homes
Project	High Road, Weston
Title	Membrane Validation of Plot 23
Drawn By	SJ
Checked By	CEH
Approved By	RS
Scale	NTS
Date Drawn	14/09/2023
Revision	
Figure No.	D41072/MV5/D2

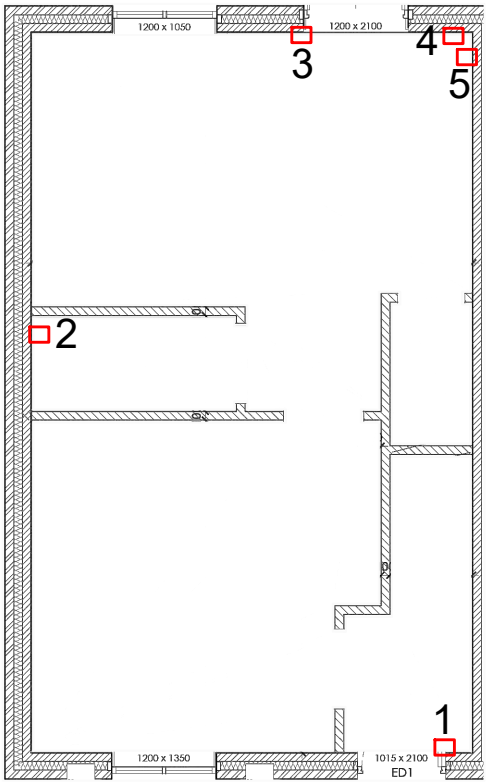
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KEY

- Service Penetration
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SUMMARY OF DEFECTS				
Defect No.	**Date of Inspection**	**Description**	**Repair**	**Date of Reinspection**
1	29/08/2023	Incomplete weld on corner seal	SAGRM patch (heat sealed)	29/08/2023
2	29/08/2023	Incomplete weld on corner seal	SAGRM patch (heat sealed)	29/08/2023
3	29/08/2023	Incomplete weld on corner seal	SAGRM patch (heat sealed)	29/08/2023
4	29/08/2023	Incomplete weld on corner seal	SAGRM patch (heat sealed)	29/08/2023

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Project No.	D41072
Client	Ashwood Homes
Project	High Road, Weston
Title	Membrane Validation of Plot 26
Drawn By	SJ
Checked By	CEH
Approved By	RS
Scale	NTS
Date Drawn	14/09/2023
Revision	
Figure No.	D41072/MV5/D3

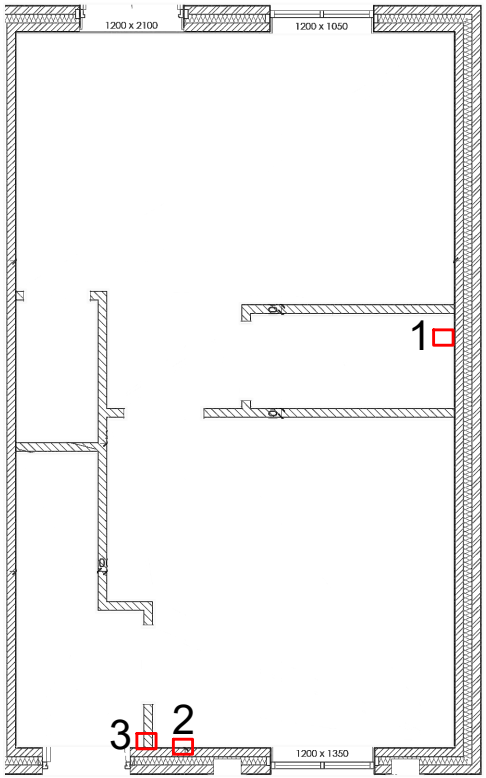
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KEY

- Service Penetration
- Validated Repair



SUMMARY OF DEFECTS				
Defect No.	**Date of Inspection**	**Description**	**Repair**	**Date of Reinspection**
1	29/08/2023	Incomplete weld on corner seal	SAGRM patch (heat sealed)	29/08/2023
2	29/08/2023	Membrane damaged (aluminium layer exposed)	SAGRM patch (heat sealed)	29/08/2023
3	29/08/2023	Incomplete weld on corner seal	SAGRM patch (heat sealed)	29/08/2023

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Project No.	D41072
Client	Ashwood Homes
Project	High Road, Weston
Title	Membrane Validation of Plot 27
Drawn By	SJ
Checked By	CEH
Approved By	RS
Scale	NTS
Date Drawn	14/09/2023
Revision	
Figure No.	D41072/MV5/D4

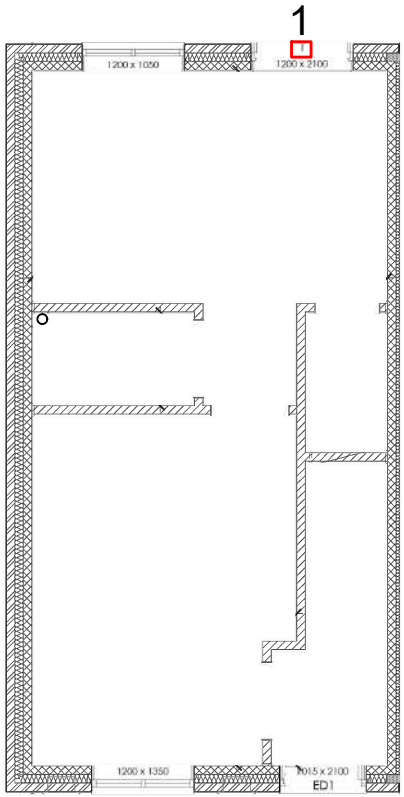
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KEY

- Service Penetration
- Validated Repair



SUMMARY OF DEFECTS				
Defect No.	**Date of Inspection**	**Description**	**Repair**	**Date of Reinspection**
1	14/08/2023	Incomplete weld on corner seal	SAGRM patch (heat sealed)	14/08/2023

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Project No.	D41072
Client	Ashwood Homes
Project	High Road, Weston
Title	Membrane Validation of Plot 28
Drawn By	SJ
Checked By	CEH
Approved By	RS
Scale	NTS
Date Drawn	14/09/2023
Revision	
Figure No.	D41072/MV5/D5

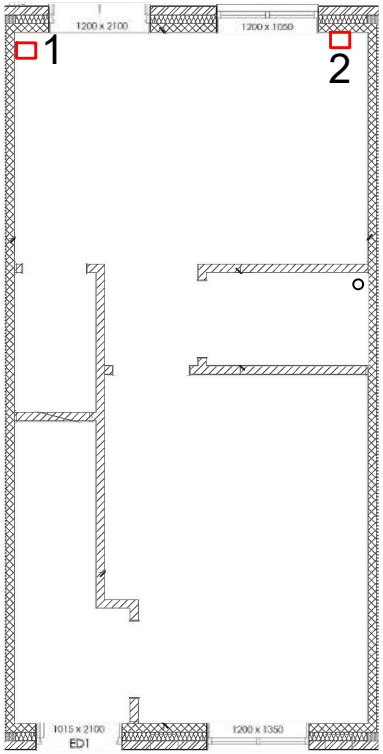
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KEY

- Service Penetration
- Validated Repair



SUMMARY OF DEFECTS				
Defect No.	**Date of Inspection**	**Description**	**Repair**	**Date of Reinspection**
1	14/08/2023	Incomplete weld on corner seal	SAGRM patch (heat sealed)	14/08/2023
2	14/08/2023	Incomplete weld on corner seal	SAGRM patch (heat sealed)	14/08/2023

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Project No.	D41072
Client	Ashwood Homes
Project	High Road, Weston
Title	Membrane Validation of Plot 29
Drawn By	SJ
Checked By	CEH
Approved By	RS
Scale	NTS
Date Drawn	14/09/2023
Revision	
Figure No.	D41072/MV5/D6

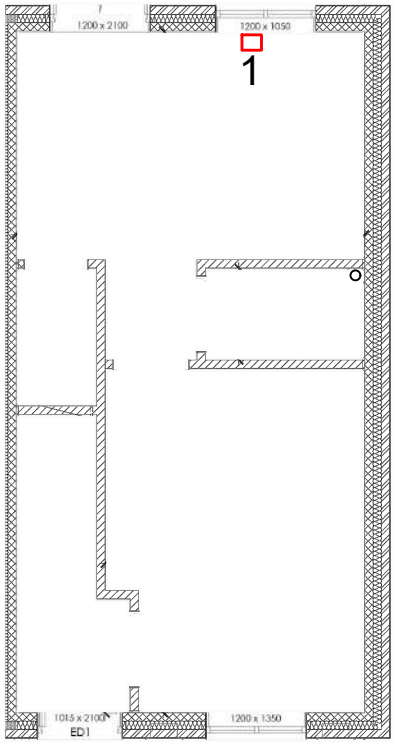
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KEY

- Service Penetration
- Validated Repair



SUMMARY OF DEFECTS				
Defect No.	**Date of Inspection**	**Description**	**Repair**	**Date of Reinspection**
1	14/08/2023	Incomplete weld on service penetration seal	SAGRM patch (heat sealed)	14/08/2023

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Project No.	D41072
Client	Ashwood Homes
Project	High Road, Weston
Title	Membrane Validation of Plot 30
Drawn By	SJ
Checked By	CEH
Approved By	RS
Scale	NTS
Date Drawn	14/09/2023
Revision	
Figure No.	D41072/MV5/D7

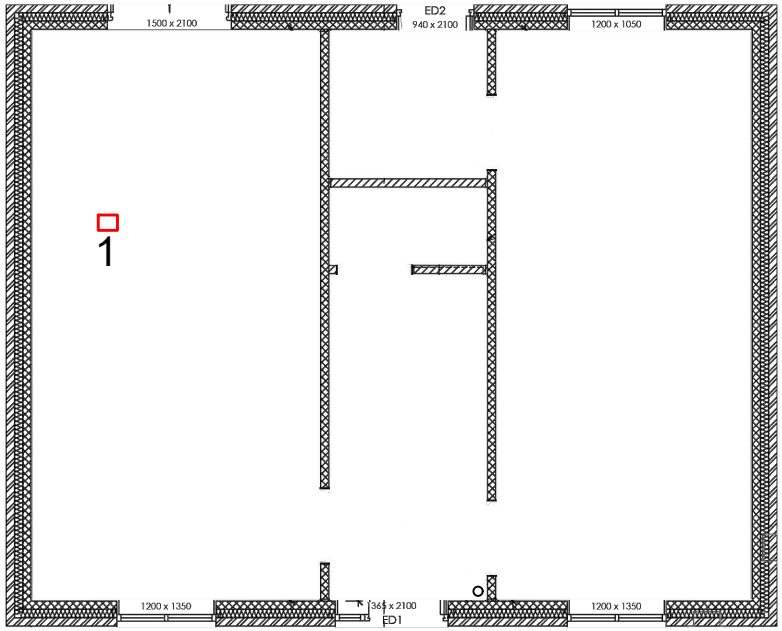
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KEY

- Service Penetration
- Validated Repair



SUMMARY OF DEFECTS				
Defect No.	**Date of Inspection**	**Description**	**Repair**	**Date of Reinspection**
1	12/09/2023	Incomplete weld	SAGRM patch (heat sealed)	12/09/2023

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Project No.	D41072
Client	Ashwood Homes
Project	High Road, Weston
Title	Membrane Validation of Plot 43
Drawn By	SJ
Checked By	CEH
Approved By	RS
Scale	NTS
Date Drawn	14/09/2023
Revision	
Figure No.	D41072/MV5/D8

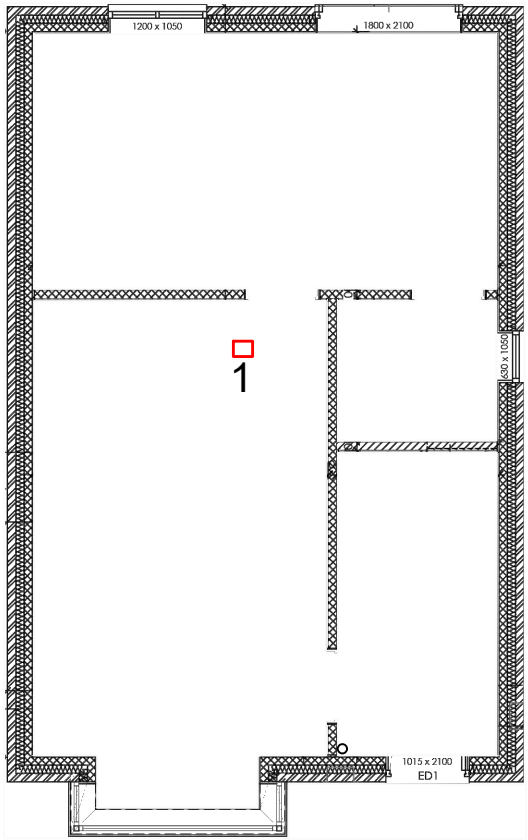
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KEY

- Service Penetration
- Validated Repair



SUMMARY OF DEFECTS				
Defect No.	**Date of Inspection**	**Description**	**Repair**	**Date of Reinspection**
1	12/09/2023	Puncture	SAGRM patch (heat sealed)	12/09/2023

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Project No.	D41072
Client	Ashwood Homes
Project	High Road, Weston
Title	Membrane Validation of Plot 44
Drawn By	SJ
Checked By	CEH
Approved By	RS
Scale	NTS
Date Drawn	14/09/2023
Revision	
Figure No.	D41072/MV5/D9

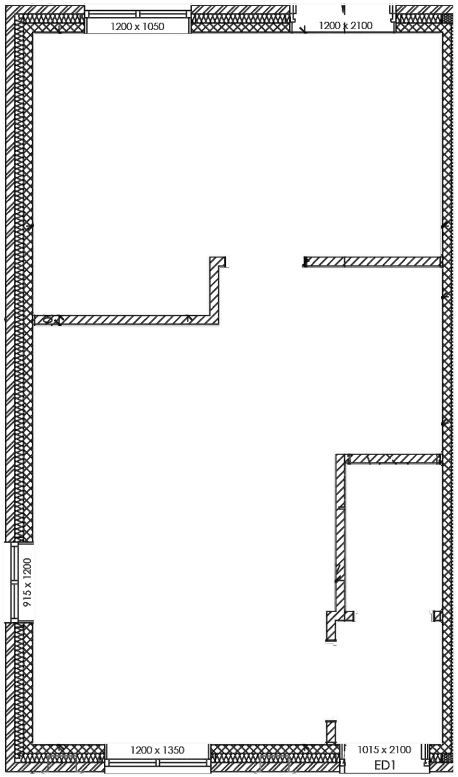
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KEY

- Service Penetration
- Validated Repair



SUMMARY OF DEFECTS				
Defect No.	**Date of Inspection**	**Description**	**Repair**	**Date of Reinspection**
-	22/11/2022	No Defects identified	-	22/11/2022

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Project No.	D41072
Client	Ashwood Homes
Project	High Road, Weston
Title	Membrane Validation of Plot 48
Drawn By	SJ
Checked By	CEH
Approved By	RS
Scale	NTS
Date Drawn	14/09/2023
Revision	
Figure No.	D41072/MV5/D10

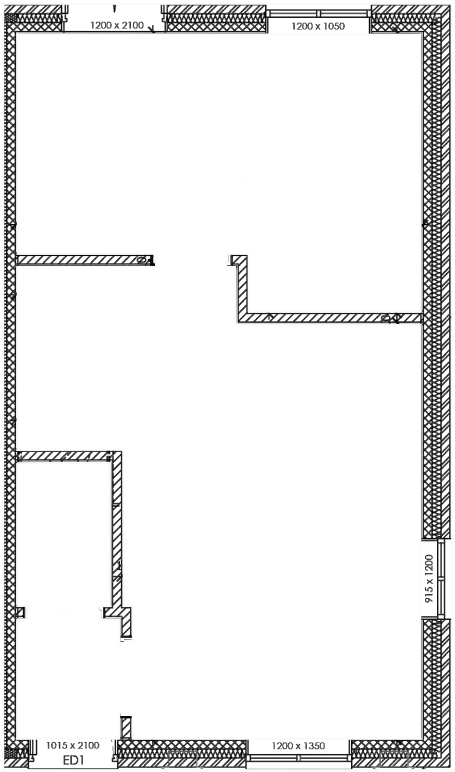
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KEY

- Service Penetration
- Validated Repair



SUMMARY OF DEFECTS				
Defect No.	**Date of Inspection**	**Description**	**Repair**	**Date of Reinspection**
-	22/11/2022	No Defects identified	-	22/11/2022

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Project No.	D41072
Client	Ashwood Homes
Project	High Road, Weston
Title	Membrane Validation of Plot 49
Drawn By	SJ
Checked By	CEH
Approved By	RS
Scale	NTS
Date Drawn	14/09/2023
Revision	
Figure No.	D41072/MV5/D11

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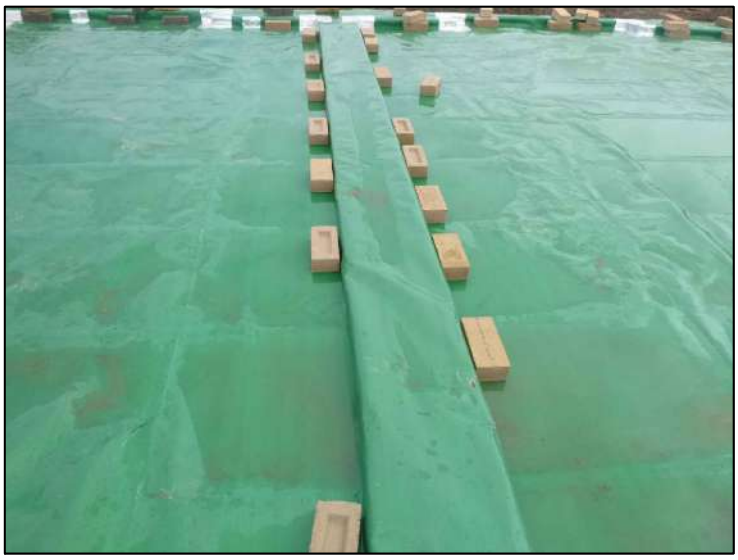
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APPENDIX III

Plates
(Figure Nos. D41072/MV5/P1 – D41072/MV5/P11)

Plot No. 22



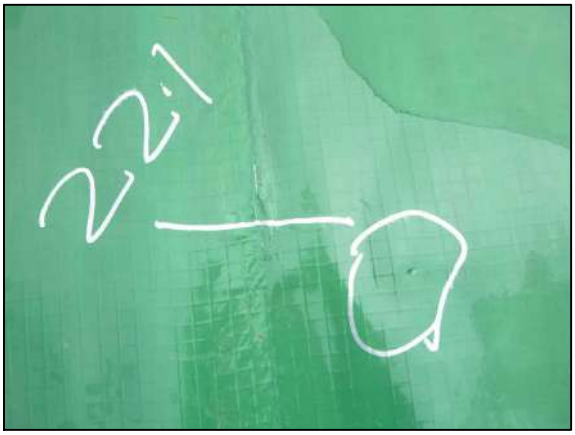
A | View of membrane extending across party wall between Plots 22 and 23



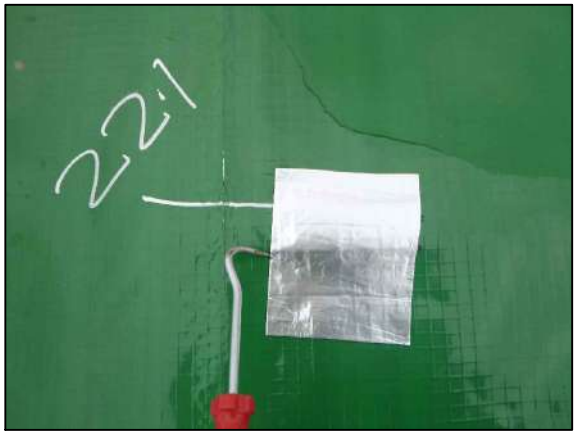
B | View of subfloor void during construction on 26/05/2023



C | SAGRM used to seal service penetrations



D | Puncture



E | SAGRM patch to repair defects in Image D

Project No.	D41072	Drawn By	SJ
Client	Ashwood Homes	Checked By	CEH
		Approved By	RS
Project	High Road, Weston	Scale	NTS
		Date Drawn	14/09/2023
Title	Plot 22 - Views during validation works on 14/08/2023	Revision	
		Figure No.	D41072/MV5/P1

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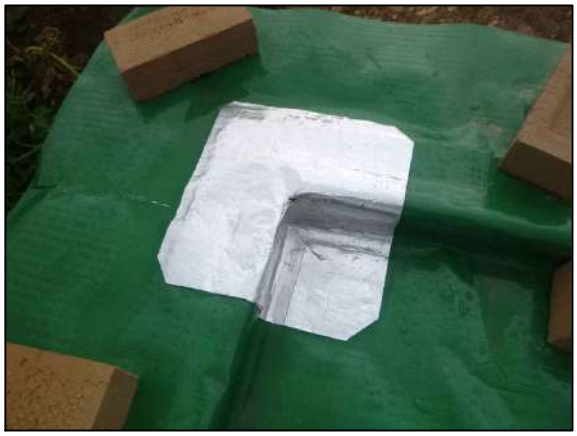
Plot No. 23



A | View of installed membrane



B | SAGRM used to seal service penetration and corner



C | SAGRM used to seal corner



D | Incomplete seal on corner detail



E | SAGRM patch to repair defect in Image D

Project No.	D41072	Drawn By	SJ
Client	Ashwood Homes	Checked By	CEH
		Approved By	RS
Project	High Road, Weston	Scale	NTS
		Date Drawn	14/09/2023
Title	Plot 23 - Views during validation works on 14/08/2023	Revision	
		Figure No.	D41072/MV5/P2

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Plot No. 26



A | View of installed membrane



B | SAGRM used to seal corner details



C | SAGRM used to seal service penetrations



D | Incomplete seal on corner detail



E | SAGRM patch to repair defect in Image D

Project No.	D41072	Drawn By	SJ
Client	Ashwood Homes	Checked By	CEH
		Approved By	RS
Project	High Road, Weston	Scale	NTS
		Date Drawn	14/09/2023
Title	Plot 26 - Views during validation works on 29/08/2023	Revision	
		Figure No.	D41072/MV5/P3

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Plot No. 27



A | View of installed membrane



B | Welded joint between membrane panels



C | SAGRM used to seal corner



D | Damage to membrane exposing aluminium layer



E | SAGRM patch to repair damage in Image D

Project No.	D41072	Drawn By	SJ
Client	Ashwood Homes	Checked By	CEH
		Approved By	RS
Project	High Road, Weston	Scale	NTS
		Date Drawn	14/09/2023
Title	Plot 27 - Views during validation works on 29/08/2023	Revision	
		Figure No.	D41072/MV5/P4

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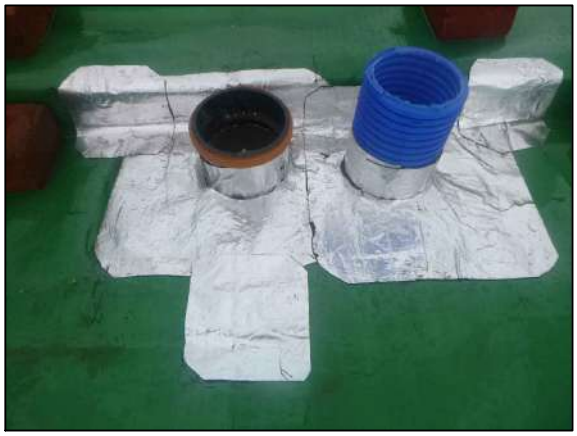
Plot No. 28



A | View of installed membrane



B | Membrane extending across party wall between Plots 28 and 29



C | SAGRM used to seal service penetrations



D | Welded joint between membrane panels



E | SAGRM used to seal corners

Project No.	D41072	Drawn By	SJ
Client	Ashwood Homes	Checked By	CEH
		Approved By	RS
Project	High Road, Weston	Scale	NTS
		Date Drawn	14/09/2023
Title	Plot 28 - Views during validation works on 14/08/2023	Revision	
		Figure No.	D41072/MV5/P5

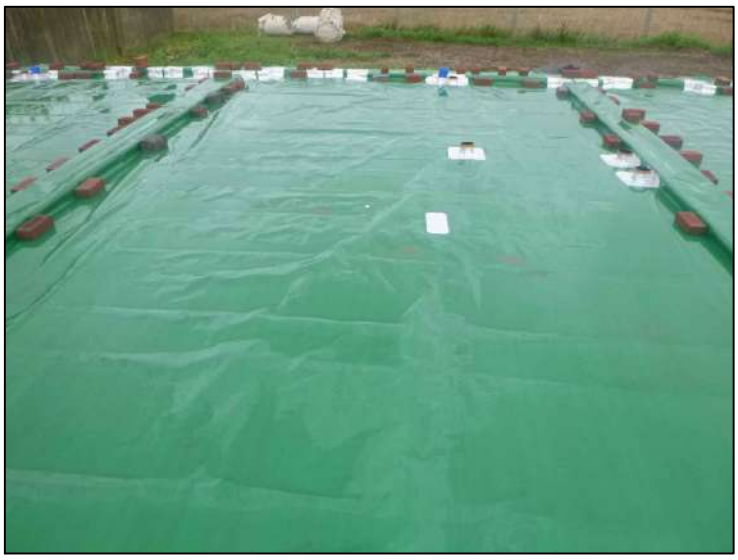
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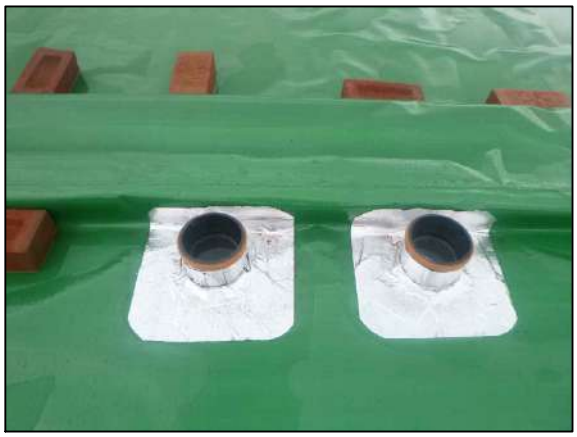
Plot No. 29



A | View of installed membrane



B | SAGRM used to seal corners



C | SAGRM used to seal service penetrations



D | Incomplete seal on corner detail



E | SAGRM patch to repair defect in Image D

Project No.	D41072	Drawn By	SJ
Client	Ashwood Homes	Checked By	CEH
		Approved By	RS
Project	High Road, Weston	Scale	NTS
		Date Drawn	08/09/2023
Title	Plot 29 - Views during validation works on 14/08/2023	Revision	
		Figure No.	D41072/MV5/P6

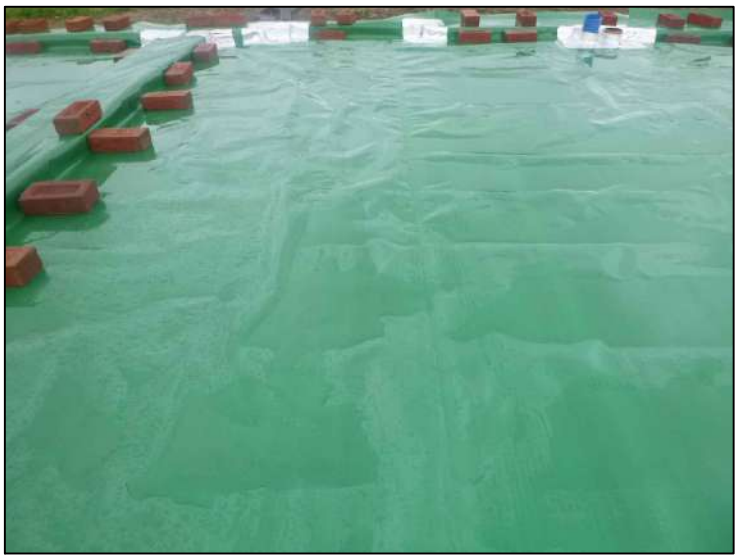
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Plot No. 30



A | View of installed membrane



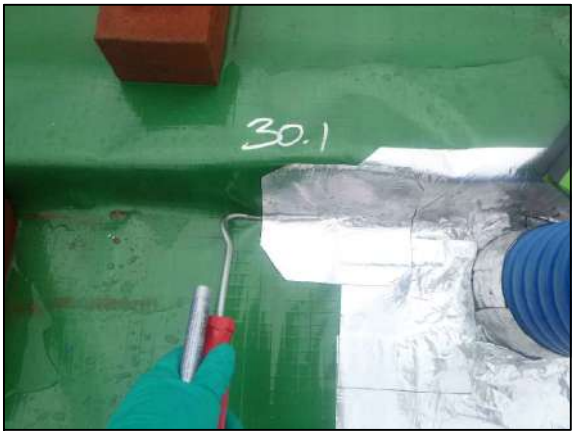
B | View of installed airbrick



C | SAGRM used to seal corners



D | Incomplete seal on service penetration



E | SAGRM patch to repair defect in Image D

Project No.	D41072	Drawn By	SJ
Client	Ashwood Homes	Checked By	CEH
		Approved By	RS
Project	High Road, Weston	Scale	NTS
		Date Drawn	14/09/2023
Title	Plot 30 - Views during validation works on 14/08/2023	Revision	
		Figure No.	D41072/MV5/P7

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Plot No. 43



A | View of installed membrane



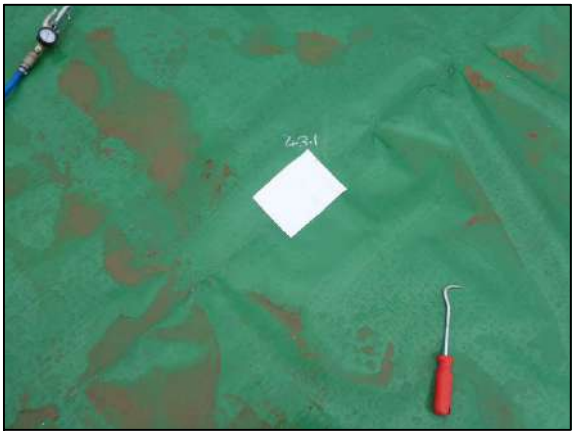
B | SAGRM used to seal corner details and service penetration



C | Membrane installed within habitable portion of garage



D | Incomplete weld between membrane panels



E | SAGRM patch to repair defect in Image D

Project No.	D41072	Drawn By	SJ
Client	Ashwood Homes	Checked By	CEH
		Approved By	RS
Project	High Road, Weston	Scale	NTS
		Date Drawn	14/09/2023
Title	Plot 43 - Views during validation works on 12/09/2023	Revision	
		Figure No.	D41072/MV5/P8

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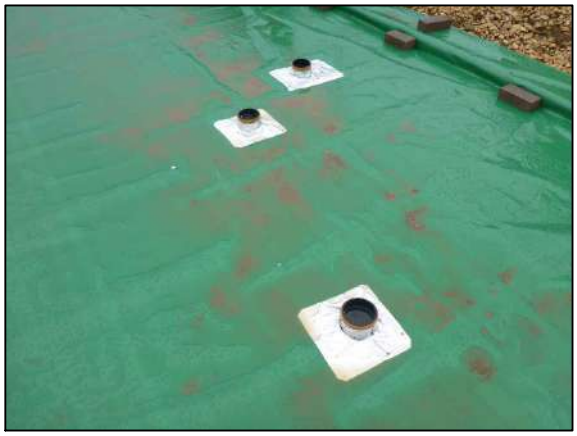
Plot No. 44



A | View of installed membrane



B | SAGRM used to seal corner and service penetrations



C | SAGRM used to seal service penetrations



D | Puncture



E | SAGRM patch to repair damage in Image D

Project No.	D41072	Drawn By	SJ
Client	Ashwood Homes	Checked By	CEH
		Approved By	RS
Project	High Road, Weston	Scale	NTS
		Date Drawn	14/09/2023
Title	Plot 44 - Views during validation works on 12/09/2023	Revision	
		Figure No.	D41072/MV5/P9

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Plot No. 48



A | View of installed membrane



B | SAGRM used to seal corners



C | View of installed airbricks



D | SAGRM used to seal service penetrations



E | Welded joint between membrane panels and SAGRM patch to repair damage

Project No.	D41072	Drawn By	SJ
Client	Ashwood Homes	Checked By	CEH
		Approved By	RS
Project	High Road, Weston	Scale	NTS
		Date Drawn	14/09/2023
Title	Plot 48 - Views during validation works on 22/11/2022	Revision	
		Figure No.	D41072/MV5/P10

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Plot No. 49



A | View of installed membrane



B | SAGRM used to seal service penetration



C | SAGRM used to seal corners



D | SAGRM used to seal service penetrations



E | View of installed airbrick

Project No.	D41072	Drawn By	SJ
Client	Ashwood Homes	Checked By	CEH
		Approved By	RS
Project	High Road, Weston	Scale	NTS
		Date Drawn	14/09/2023
Title	Plot 49 - Views during validation works on 22/11/2022	Revision	
		Figure No.	D41072/MV5/P11

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APPENDIX IV

Validation Tracker

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D41072 MEMBRANE VALIDATION TRACKER						
Plot	Inspection Visit	Membrane Installers	Installation Method	Membrane Installed (Type)	Comment (FAIL/ PENDING/ PASS)	Validation Report Ref.
1	06/10/2022	OLS	Full Lineout	Juta GP-1	PASS	D41072/MV1/CEH
2	06/10/2022	OLS	Full Lineout	Juta GP-1	PASS	D41072/MV1/CEH
3	30/11/2022	UKM	Full Lineout	Multigas 500	PASS	D41072/MV1/CEH
4	30/11/2022	UKM	Full Lineout	Multigas 500	PASS	D41072/MV1/CEH
5	22/11/2022	UKM	Full Lineout	Multigas 500	PASS	D41072/MV1/CEH
6	22/11/2022	UKM	Full Lineout	Multigas 500	PASS	D41072/MV1/CEH
7	27/01/2023	UKM	Full Lineout	Multigas 500	PASS	D41072/MV2/CEH
8	16/05/2023	UKM	Full Lineout	Multigas 500	PASS	D41072/MV3/CEH
9					PENDING	
10					PENDING	
11					PENDING	
12					PENDING	
13					PENDING	
14					PENDING	
15					PENDING	
16					PENDING	
17					PENDING	
18					PENDING	
19					PENDING	
20					PENDING	
21					PENDING	
22	14/08/2023	UKM	Full Lineout	Multigas 500	PASS	D41072/MV5/CEH
23	14/08/2023	UKM	Full Lineout	Multigas 500	PASS	D41072/MV5/CEH
24	26/06/2023	UKM	Full Lineout	Multigas 500	PASS	D41072/MV4/CEH
25	26/06/2023	UKM	Full Lineout	Multigas 500	PASS	D41072/MV4/CEH
26	29/08/2023	UKM	Full Lineout	Multigas 500	PASS	D41072/MV5/CEH
27	29/08/2023	UKM	Full Lineout	Multigas 500	PASS	D41072/MV5/CEH
28	29/08/2023	UKM	Full Lineout	Multigas 500	PASS	D41072/MV5/CEH
29	29/08/2023	UKM	Full Lineout	Multigas 500	PASS	D41072/MV5/CEH
30	29/08/2023	UKM	Full Lineout	Multigas 500	PASS	D41072/MV5/CEH
31	26/06/2023	UKM	Full Lineout	Multigas 500	PASS	D41072/MV4/CEH
32	26/06/2023	UKM	Full Lineout	Multigas 500	PASS	D41072/MV4/CEH
33	26/06/2023	UKM	Full Lineout	Multigas 500	PASS	D41072/MV4/CEH
34	26/06/2023	UKM	Full Lineout	Multigas 500	PASS	D41072/MV4/CEH
35	26/05/2023	UKM	Full Lineout	Multigas 500	PASS	D41072/MV4/CEH
36	26/05/2023	UKM	Full Lineout	Multigas 500	PASS	D41072/MV4/CEH
37	26/05/2023	UKM	Full Lineout	Multigas 500	PASS	D41072/MV4/CEH
38	26/05/2023	UKM	Full Lineout	Multigas 500	PASS	D41072/MV4/CEH
39					PENDING	
40					PENDING	
41					PENDING	
42					PENDING	

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D41072 MEMBRANE VALIDATION TRACKER						
Plot	Inspection Visit	Membrane Installers	Installation Method	Membrane Installed (Type)	Comment (FAIL/ PENDING/ PASS)	Validation Report Ref.
43	12/09/2023	UKM	Total Lineout	Multigas 500	PASS	D41072/MV5/CEH
44	12/09/2023	UKM	Total Lineout	Multigas 500	PASS	D41072/MV5/CEH
45	03/04/2023	UKM	Total Lineout	Multigas 500	PASS	D41072/MV3/CEH
46	03/04/2023	UKM	Total Lineout	Multigas 500	PASS	D41072/MV3/CEH
47	06/02/2023	UKM	Total Lineout	Multigas 500	PASS	D41072/MV2/CEH
48	22/11/2022	UKM	Total Lineout	Multigas 500	PASS	D41072/MV5/CEH
49	22/11/2022	UKM	Total Lineout	Multigas 500	PASS	D41072/MV5/CEH
50	04/01/2023	UKM	Total Lineout	Multigas 500	PASS	D41072/MV2/CEH
51	03/04/2023	UKM	Total Lineout	Multigas 500	PASS	D41072/MV3/CEH
52	03/04/2023	UKM	Total Lineout	Multigas 500	PASS	D41072/MV3/CEH
53	03/04/2023	UKM	Total Lineout	Multigas 500	PASS	D41072/MV3/CEH
54	03/04/2023	UKM	Total Lineout	Multigas 500	PASS	D41072/MV3/CEH
55	03/04/2023	UKM	Total Lineout	Multigas 500	PASS	D41072/MV3/CEH
56					PENDING	
57					PENDING	
58	27/02/2023	UKM	Total Lineout	Multigas 500	PASS	D41072/MV2/CEH
59	14/10/2022	OLS	Perimeter & Infill	Juta GP-1	PASS	D41072/MV1/CEH
60	14/10/2022	OLS	Perimeter & Infill	Juta GP-1	PASS	D41072/MV1/CEH
61	27/02/2023	UKM	Perimeter & Infill	Multigas 500	PASS	D41072/MV2/CEH
62	20/01/2023	OLS / UKM	Perimeter & Infill	Juta GP-1	PASS	D41072/MV2/CEH
63	10/01/2023	OLS / UKM	Perimeter & Infill	Juta GP-1	PASS	D41072/MV2/CEH
64	27/01/2023	OLS / UKM	Perimeter & Infill	Juta GP-1	PASS	D41072/MV2/CEH
65	19/10/2022	OLS	Perimeter & Infill	Juta GP-1	PASS	D41072/MV1/CEH
66	19/10/2022	OLS	Perimeter & Infill	Juta GP-1	PASS	D41072/MV1/CEH
66	19/10/2022	OLS	Perimeter & Infill	Juta GP-1	PASS	D41072/MV1/CEH
67	19/10/2022	OLS	Perimeter & Infill	Juta GP-1	PASS	D41072/MV1/CEH
68	28/09/2022	OLS	Perimeter & Infill	Juta GP-1	PASS	D41072/MV1/CEH

KEY

PASS	Membrane installation and validation complete
PENDING	Awaiting membrane installation/validation
FAIL	Membrane installation unsatisfactory at time of inspection

OLS – Omega Lining Solutions

UKM – UK Membranes

GeoDyne

APPENDIX V

Conditions & Limitations

Conditions & Limitations

Phase I Desk Studies

1. Works undertaken to provide the basis of the Phase I Desk Study report comprise a review of information available from a number of sources/parties (potentially also including the Client) together with a walk over of the site (where applicable and included within the quotation). The opinions given in the Phase I Desk Study are based on the information available from third parties/sources that has been obtained within the available timeframe. GeoDyne Limited assumes all third party information to be true and correct and therefore cannot accept liability for the accuracy of such information supplied.

2. Should additional information become available that may affect the comments and opinions made within the Phase I Desk Study, GeoDyne Limited reserves the right to review such information and make modifications to comments/opinions as appropriate.

3. It should be borne in mind that a Phase I Desk Study collates available information to generate a conceptual model of the site. The actual geotechnical and environmental considerations can only be fully quantified by intrusive investigation works to confirm the accuracy of the conceptual site model.

Phase II Intrusive Investigations

1. Our quotation assumes that access to the site will be arranged by others at no cost to ourselves.

2. We have assumed that free access is available throughout to the entire site and that works can be undertaken during a single mobilisation. Where restricted access is encountered, or where additional unscheduled mobilisations are required, additional costs may be incurred to the client.

3. We have assumed that all available information relating to buried services will be supplied by the Client at no cost to ourselves. No responsibility will be accepted for damage to underground services that have not been brought to our prior attention by the Client.

4. All excavations/boreholes will be backfilled with compacted arisings upon completion, with any excess arisings left proud of ground levels. Excess arisings will not be removed from the site unless specifically requested by the Client. Where we are requested to remove excess arisings, all associated costs will be passed to the Client.

5. We will attempt to leave the site in a clean and tidy state, however, it must be understood that some disturbance of the site is unavoidable during intrusive works.

6. Exploratory holes are positioned approximately on site by GeoDyne Limited. Should the client require precise locations of all exploratory points, additional fees will be incurred. It must be borne in mind that backfilled trial pits can create ‘soft spots’, therefore, should the Client wish to designate ‘no dig’ zones, for example under the footprint of proposed structures, these must be brought to our attention prior to commencement of works.

7. Groundwater observations relate to conditions encountered at the time of investigation. It must be understood that groundwater levels may vary as a result of recent climatic conditions or seasonal variation.

8. Trial pits and boreholes examine only a small proportion of the total site area. No liability can be accepted for conditions not revealed in exploratory holes, particularly between positions. All extrapolations of available data are given in good faith.

Payment

1 Payment terms are strictly 28 days from the invoice date.

2 Prior to commencement of works, we require receipt of formal written instruction from the party accepting full financial responsibility for the work. In the absence of such an instruction, we would expect the instructing Consulting Engineers/Architects to accept full financial responsibility for the works.

3 Receipt of instruction to commence work shall be taken as acceptance and compliance of the foregoing conditions.

Liability

1. GeoDyne Limited offer £5,000,000.00 Professional Indemnity Insurance (in aggregate over the year). This shall be the limit of our liability for works undertaken. No individual liability shall be implied to, or accepted by, any employee for works undertaken for and on the behalf of GeoDyne Limited.