Abbeydale
Building Environment Consultants

VERIFICATION REPORT

King James' School, St Helen's Gate, Aldmondbury, Huddersfield, West Yorkshire

Report: 574010VR

Date: October 2021

Client:
Esh Construction
Esh House
Bowburn North Industrial Estate
Durham
DH6 5PF

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VERIFICATION REPORT

King James' School, Aldmondbury

DOCUMENT VERIFICATION SHEET

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TABLE OF CONTENTS

APPENDICES

VERIFICATION REPORT

King James' School, Aldmondbury

1. INTRODUCTION

On the instruction of Esh Construction, a Verification Report has been prepared by Abbeydale Building Environment Consultants Ltd (Abbeydale BEC) for the ground gas protection measures installed in the proposed new classroom block within the grounds of King James' School in Almondbury, near Huddersfield.

The school site is situated on the south side of Almondbury, centred on National Grid Reference 417133(E), 414796(N) with a site area of around 6.8 ha. See Figure 1.

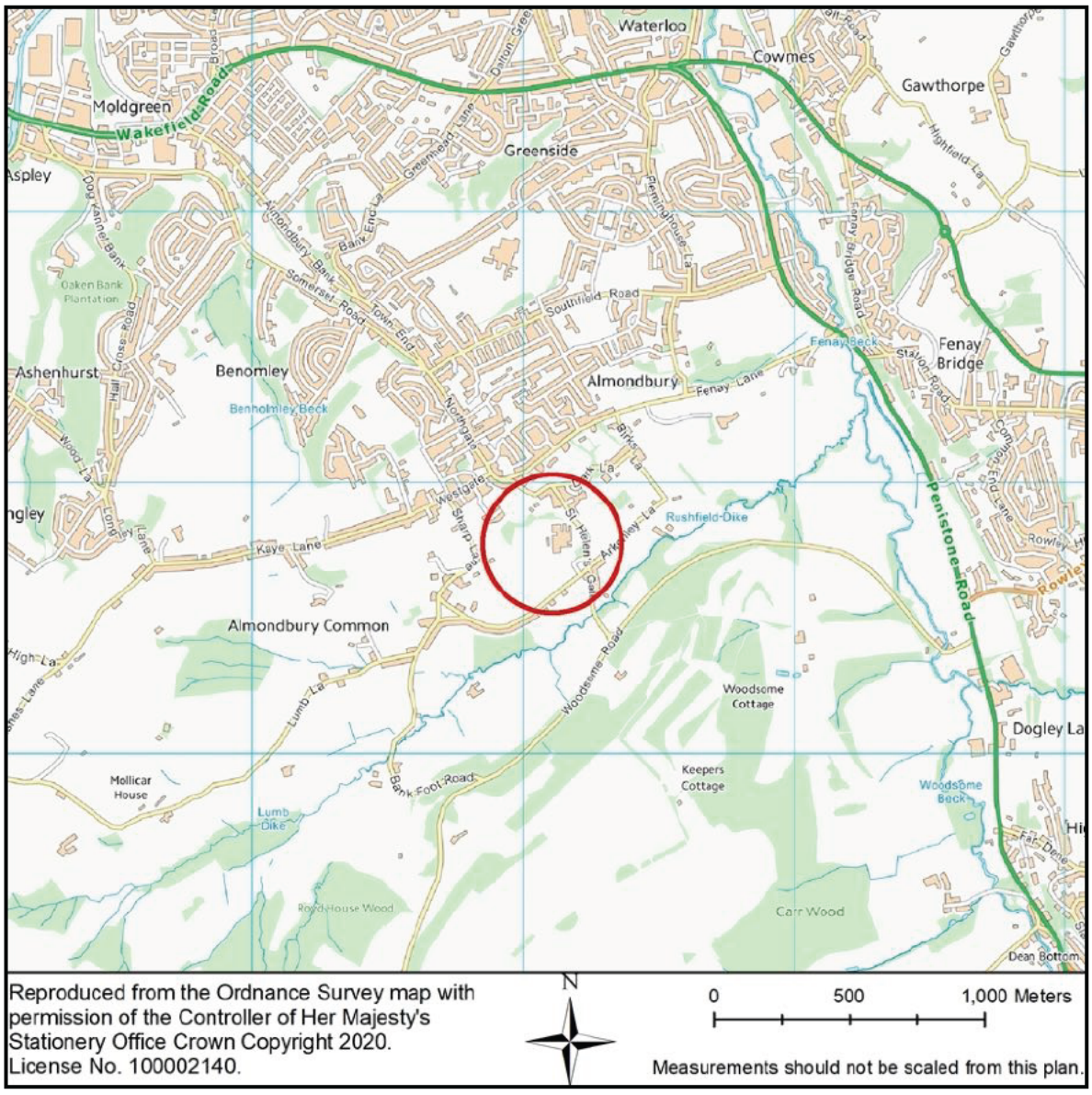


FIGURE 1 - SITE LOCATION PLAN

This report was produced for our client, Farrell & Clark LLP, and their advisors and financiers and should not be relied upon or transferred to any other parties without the express written authorisation of Abbeydale BEC and our client. If any other unauthorised third party comes into possession of this report they rely on it at their own risk and the authors owe them no duty of care or skill.

The comments and recommendations presented in this Verification Report are based on the findings of a review of available information; observations made during site visits throughout the installation of the ground gas protection measures, and a series of previous reports produced for the site. These include a Phase 1 Desk Study report (Ref: 574010DS), dated December 2019, two subsequent Ground Investigation reports dated December 2019 (Ref: 574010GI) and July 2020 (Ref: 574010GI2), and a Remediation Method Statement (Ref: 574010RMSa) prepared in January 2021.

Where information has been referenced from any of the previously prepared reports it is clearly stated in the text of this Verification Report.

When writing this report construction of the new two storey classroom block and associated retaining structures was underway. A proposed layout plan is included in Appendix A.

2. OBJECTIVES

This report has been undertaken to confirm that the proposed ground gas protection measures have been implemented into the design and construction of the proposed classroom block.

This includes a summary of the validation works undertaken during the installation of the ground gas protection measures and any corrective measures undertaken where any defects were identified by the Validation Engineer.

3. THE SITE

The area of the new classroom block is situated towards the north-west of the larger King James' School site. The existing site layout is shown on Figure 2, including the indicative location of the new classroom block which is outlined in purple.

At the time of undertaking the validation works the new classroom was partially constructed, with the steel portal frame in place and the lower layers of brickwork built around the perimeter of the new building, up to the level at which the air bricks for passive ventilation of the subfloor were to be installed.

A lift pit had been formed towards the south of the proposed new building, which was later completed as the validation works progressed.

Behind (north-west) of the new classroom block a series of terraced gaboon basket retaining walls had been cut into the former embankment. We understand that these have been seeded and will naturally vegetate.

The existing school buildings have been constructed on benches, with the new classroom block bounded by a grassed embankment sloping up to a sports pitch to the north-west of the building. The topography of the area generally slopes down to the south-east, following the natural valley feature.

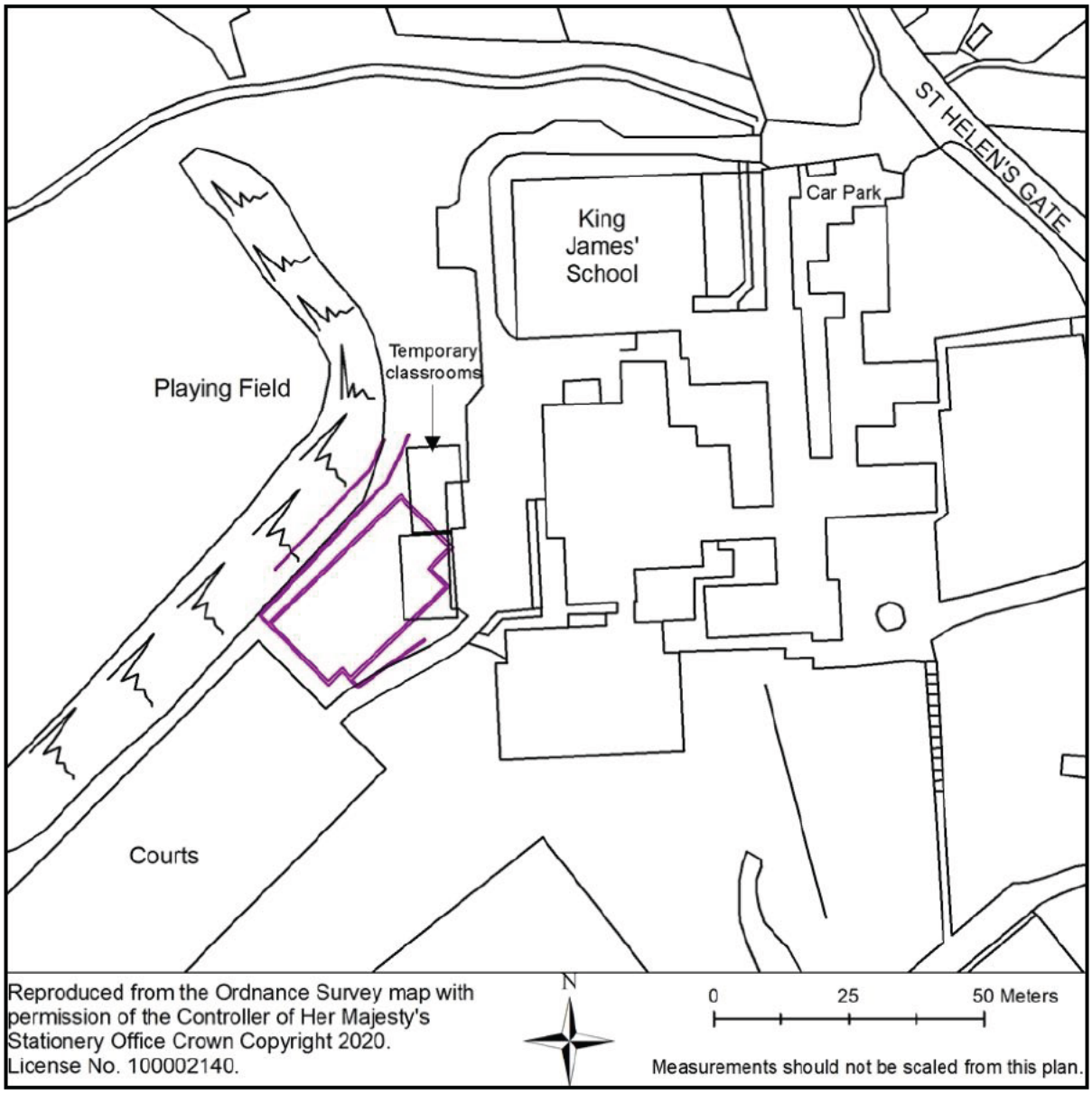


FIGURE 2 - SITE PLAN

4. PREVIOUS REPORTS

Two Ground Investigation reports (Ref: 574010GI), dated December 2019 and (Ref:574010GI2), dated July 2020, were produced to identify any potential geo-environmental risks to future receptors. The report concluded that there was a risk to

future site users from hazardous ground gases and ground gas protection measures will be required in the proposed building.

A subsequent Remediation Method Statement dated January 2021 was produced to outline the scope of remediation measures that needed to be implemented into the design and construction of the proposed classroom block, to mitigate ground gas ingress into the building that could otherwise have an adverse risk to human health receptors.

5. REMEDIATION STRATEGY

The Remediation Method Statement outlined the scope of ground gas protection measures based on the proposed construction of the building. The scope of gas protection measures included three main elements:

- Passive ventilation - as a ground bearing floor slab is to be used, a void former was specified for beneath the proposed ground floor slab. This was to be vented to the outside atmosphere using telescopic plastic vents and air bricks. A total of 12 vents were installed down each length of the new classroom building, as designed by Seal-A-Pipe Ltd to ensure a sufficient air change to allow any accumulated ground gases to ventilate into the outside atmosphere.
- Gas resistant membrane - as a final precaution against the ingress of potential ground gases into the building, it was specified that a suitable gas resistant membrane shall be installed directly above the passive ventilation void former. Any penetrations through the gas membrane for services were to be fully sealed to stop any potential ground gases getting into the building through these pathways.
- Structural barrier - the use of a ground bearing floor slab will in itself provide a degree of protection against the ingress of ground gases into the building.

In accordance with CIRIA 735 and YALPAG guidance, validation visits will need to be undertaken by an appropriately experienced independent Validation Engineer.

During each visit the Abbeydale BEC Validation Engineer will complete a pro forma record sheet as per the example provided in Appendix A5 of CIRIA 735; included as Appendix E. Relevant photograph records will be taken (provided as Appendix D); where relevant these will include any defects observed and further photographic evidence once any necessary corrective measures have been applied, to allow validation of the membrane installation. If any follow-on validation is deemed necessary this will be clearly highlighted on the pro forma record sheet(s).

All installation works were undertaken by Seal-A-Pipe Ltd (SAP), a reputable and experienced contractor and membrane installer, including the selection of appropriate materials, as agreed with Abbeydale BEC. SAP have their own patented vapour barrier sealant; a reinforced butyl rubber sealant that has BRE approval (Report No. P112926-10001) which will be used to seal the joints in the gas membrane.

The need for integrity testing was to be dependant on the jointing system used, and also how quickly the gas membrane was protected against any potential follow-on damage after a final visual inspection of the membrane had been undertaken.

6. VALIDATION VISITS

An Abbeydale BEC Geo-environmental Engineer attended site on a part-time basis throughout the installation of the ground gas protection measures, which spanned from 11 August 2021 to 1 September 2021. This was largely due to having to stand down for a period whilst the main contractor cleared part of the building footprint of general building materials that otherwise prevented installation of the gas protection measures. A summary of the validation visits undertaken is given below, and photographic records taken during the various monitoring visits are presented in Appendix D. Completed site inspection pro forma sheets using the template from CIRIA C735:2015 are included as Appendix E.

An initial site visit was undertaken on 11 August 2021 when the installation of the gas protection system commenced. This included a discussion / toolbox talk with the Site Manager that no site personnel should be allowed to walk across either the underfloor void former, or subsequently the gas proof membrane once installation began, and that no equipment should be dragged across either of these surfaces. Doing so may inadvertently damage the integrity of either of these products and result in delays if the materials had to be removed and replaced. The lift shaft pit had been formed and awaited fixing of the ground gas protection membrane.

It was also noted that sections of gas-resistant membrane had been installed by SAP underneath the internal concrete stairs, with a reinforced yellow gas membrane seen protruding from under the footprint of the stairs. This was done under the supervision of SAP on 10 August 2021.

Subsequent daily site visits were then undertaken on 12 and 13 August 2021 to carry out further visual inspections during the installation of the void former and overlying gas-resistant membrane. During the site visit on 13 August 2021 the lift shaft was noted to have been infilled with concrete and it was noted that a silver gas-resistant membrane had been fixed to the walls of the lift shaft and lapped back over so that the gas-resistant membrane above the ground bearing floor could seal onto the lift shaft membrane.

Following a site visit on 16 August 2021, Seal-A-Pipe had to postpone installation of the remaining gas protection measures whilst the client cleared some general building materials from across the southern part of the new building before the void former and gas membrane were installed. This was done to avoid the potential for follow-on damages to the various components of the ground gas protection system once installed. During this site inspection visit it was noted that some of the gas membrane in front of the north-eastern internal concrete stairs had been ripped. It was agreed with SAP that the main gas membrane would be sealed over this membrane and lap up the first step, onto which the ground bearing floor slab would be cast up to. This would ensure that the gas-resistant membrane effectively sealed

around the internal staircase. See Plates 17 and 24 in Appendix D. This was noted to have been implemented by the subsequent site visit on August 26 20201

Installation works subsequently commenced again on 25 August 2021, and a visual inspection was undertaken on 26 August 2021 and the remaining area of the void former and overlying PAGeotechnical gas-resistant membrane had been laid.

Where the mesh reinforcement for the new ground bearing floor slab had been stored, towards the east of the new building, some localised punctures were identified which penetrated through the gas-resistant membrane. These were indicative of the steel mesh having been pushed slightly once put on the ground, see Plate 19 in Appendix D. These were locally sealed using squares of the same gas membrane and sealed using Seal-A-Pipe's butyl sealant and the overlap taped down to avoid a trip hazard or the membrane getting snagged along the joint, as shown on Plate 20 in the photographic record.

A final site inspection visit was undertaken on 1 September 2021, to observe placement of the steel mesh reinforcement and ensure that no potential visual defects were identifiable prior to placement of the concrete ground bearing floor slab, which was subsequently undertaken on 2 September 2021 to protect the components of the ground gas protection system as soon as practical.

7. GROUND GAS PROTECTION MEASURES

As outlined in the Remediation Method Statement, the ground gas protection measures consisted of a series of components to meet the minimum ground gas protection score of 3.5, to meet the requirements of BS8485:2015.

The void former used was produced by ABG Geosynthetics Ltd, known as Gasflow; a 25mm thick cuspated geosynthetic high density polyethylene (HDPE) with a non-woven geotextile layer bonded to the bottom of the void former. A technical specification sheet for the void former is included in Appendix B. To provide passive ventilation to the outside atmosphere a series of twelve plastic telescopic vents with plastic air brick covers were installed along the north-west and south-east elevations of the building.

As outlined in BS8485:2015 a gas protection score of 1.5 can be awarded for installation of the geocomposite void formers as the width of the building is less than 15m.

A PAGeotechnical Standard Gas Barrier was placed over the void former used across the proposed ground bearing floor slab; a reinforced gas proof membrane that is certified to protect against methane and carbon dioxide. The technical specification / product sheets for the membranes used are included in Appendix C.

The PAG membrane was laid in 2.00m wide rolls, with each joint sealed using Seal-A-Pipe's butyl sealant and a hand roller. A minimum 150mm overlap was used between each of the sheets laid; the lap was secured using cloth tape to avoid any

potential trip hazard and avoid the potential for the membranes to be pulled and therefore potentially affect the seal of the membrane joints.

From the edge of the new ground bearing floor slab to the outside walls a thicker Rhinoplast Evolution Hydrocarbon Barrier was used to act as a gas-resistant Damp Proof Membrane (DPM) that would be less resistant to any potential follow-on damages after installation of the membrane.

The gas membranes used are rated as sufficient to meet the minimum requirements for a Characteristic Situation 2 (CS2) risk classification; a gas protection score of 2.0 was therefore given for the use of gas resistant membrane in accordance with BS8485:2015.

Where supporting steel columns of the portal frame were present, pre-fabricated squares of gas membrane using the Rhinoplast Evolution gas barrier had been prepared by SAP to ensure a good fit around the columns, see Plates 2 and 18 in Appendix D. These were joined to the main gas membrane using Seal-A-Pipe's butyl sealant, which was also injected around the columns to ensure a good seal.

The same approach was taken to seal service entries; a pre-cut square of gas resistant membrane for the relevant service diameters were placed over each service entry by SAP and sealed onto the main gas membrane. A flexible rubber top-hat was then pulled over each service which was also sealed using SAP butyl sealant onto the gas membrane. An example of the sealing of service entries is shown on Plates 7, 12, and 13.

On completion of the final site inspection visit we understand that the concrete floor slab was cast the following day, 2 September 2021. The cast in-situ reinforced concrete floor slab will also provide a degree of protection against the ingress of potential ground gases into the building, and can be awarded a gas protection score of 0.5 points in accordance with BS8485:2015.

Based on the gas protection score of the different components of the ground gas protection system a total of 4.0 gas protection points have been awarded, surpassing the minimum 3.5 points required in accordance with BS8485:2015.

8. NON COMPLIANCES

As perviously outlined, the only identified defects noted during the installation of the ground gas protection system were noted during the site visit on 26 September 2021, when localised puncturing of the gas membrane had been caused by movement of the steel reinforcement mesh. Localised repairs were undertaken by the installation contractor by sealing areas of gas membrane over the identified areas of damages and no other visual signs of potential damage were noted elsewhere on the final site inspection visit before the concrete floor slab was cast.

9. IMPORTED SOILS

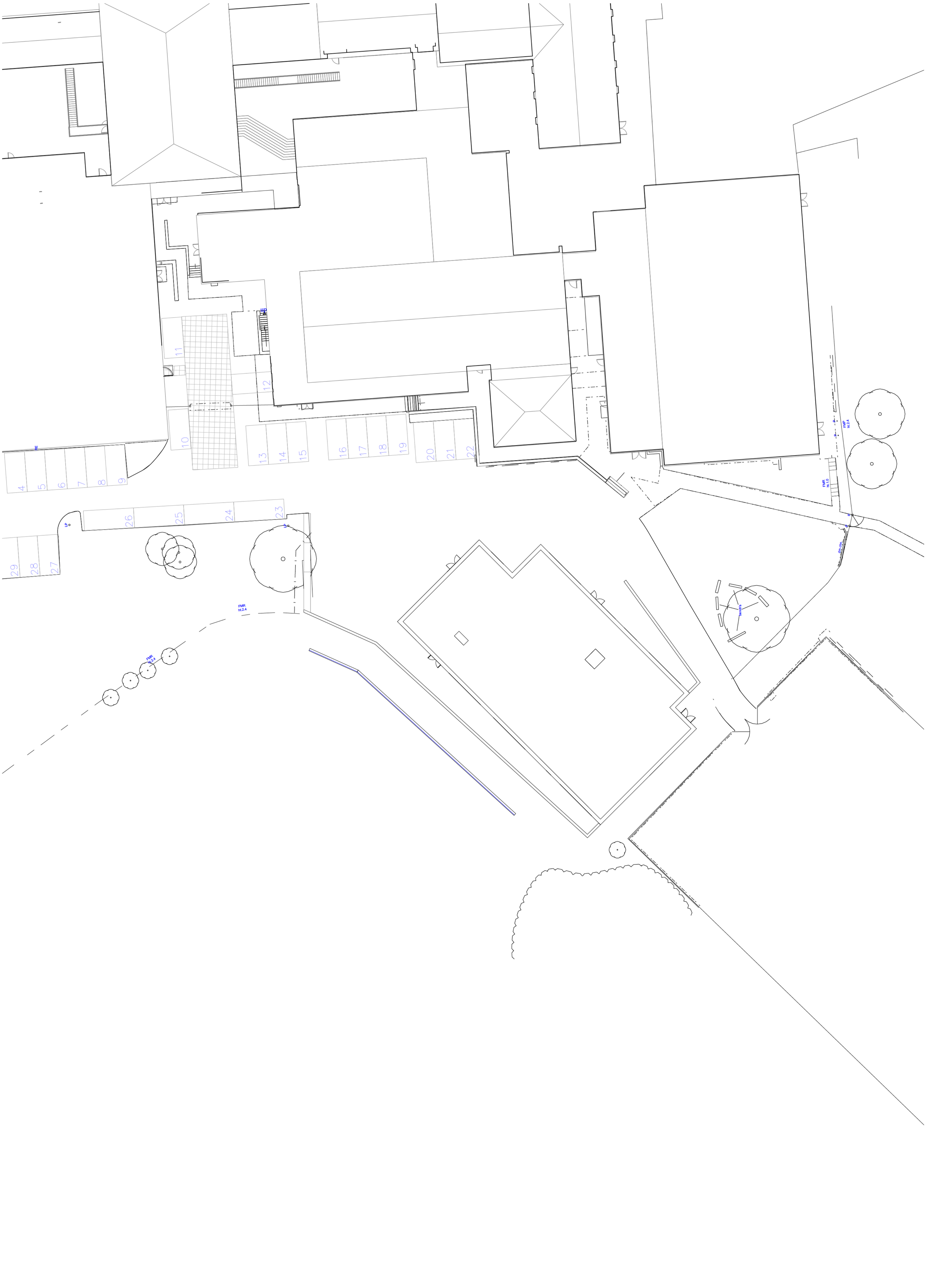
We understand that no imported soils were brought to site as part of the development works that required chemical validation to confirm their suitability for use in general landscaping areas.

10. CONCLUSION

We conclude that the ground gas protection measures have been installed in accordance with the requirements set out in the Remediation Method Statement, to satisfy the requirements outlined in BS8485:2015 and provide the required level of protection against the ingress of potential ground gases into the building.

Report 574010VR | October 2021

APPENDIX A - PROPOSED DRAWINGS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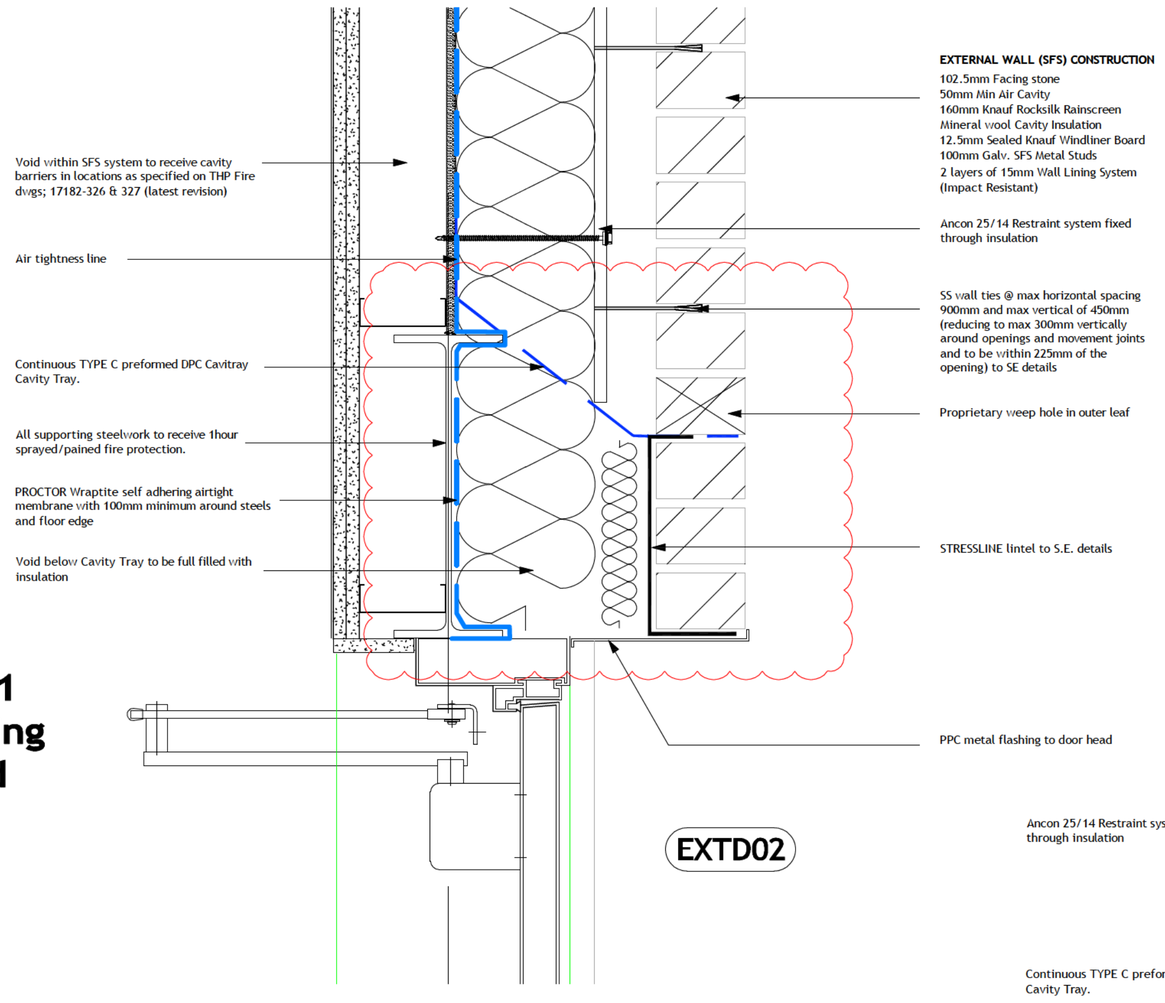
ht.2.4
FMP
ht.2.4
FMR
ht.1.0
dmd dm
bench
FMR
ht.2.4

Refer to SE dwgs and fabrictoctors details for steelwork and floor design.

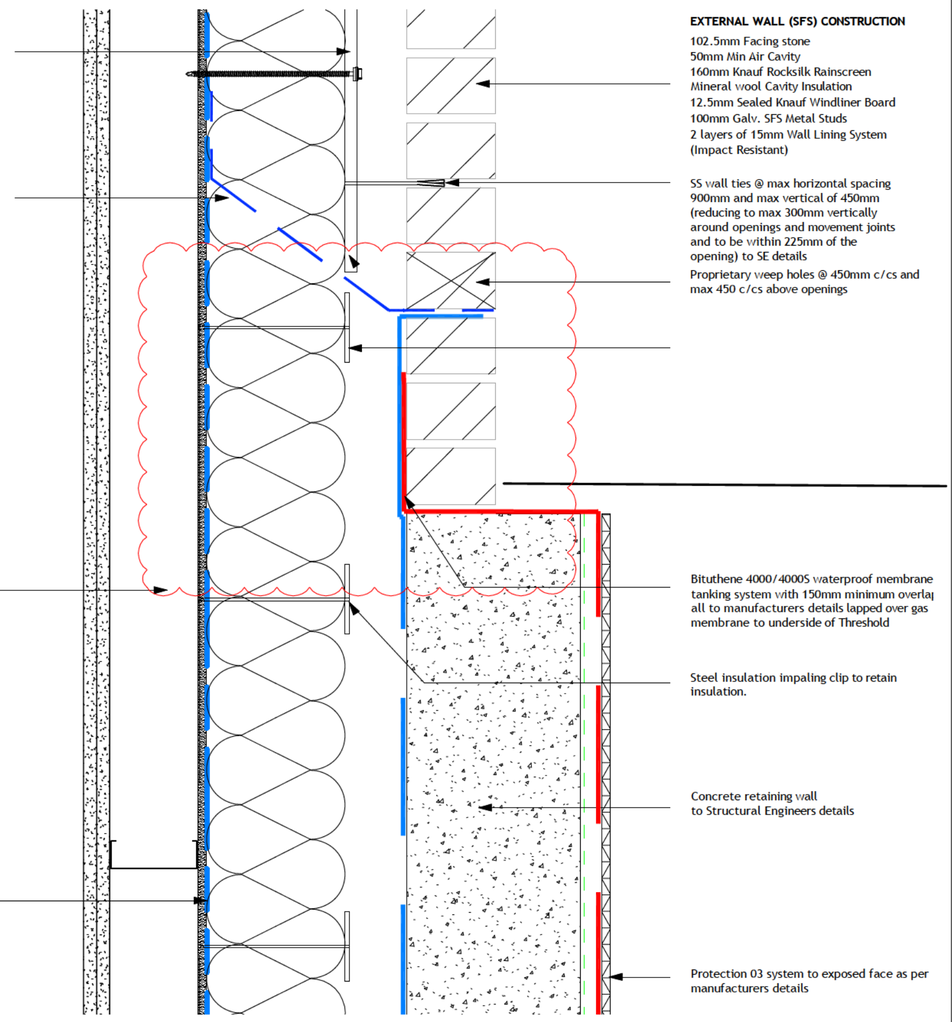
All specified manufactures are or similar.

0 50 100 150 200 250mm
SCALE 1:5

Staircase 1 Half Landing Door Head Detail

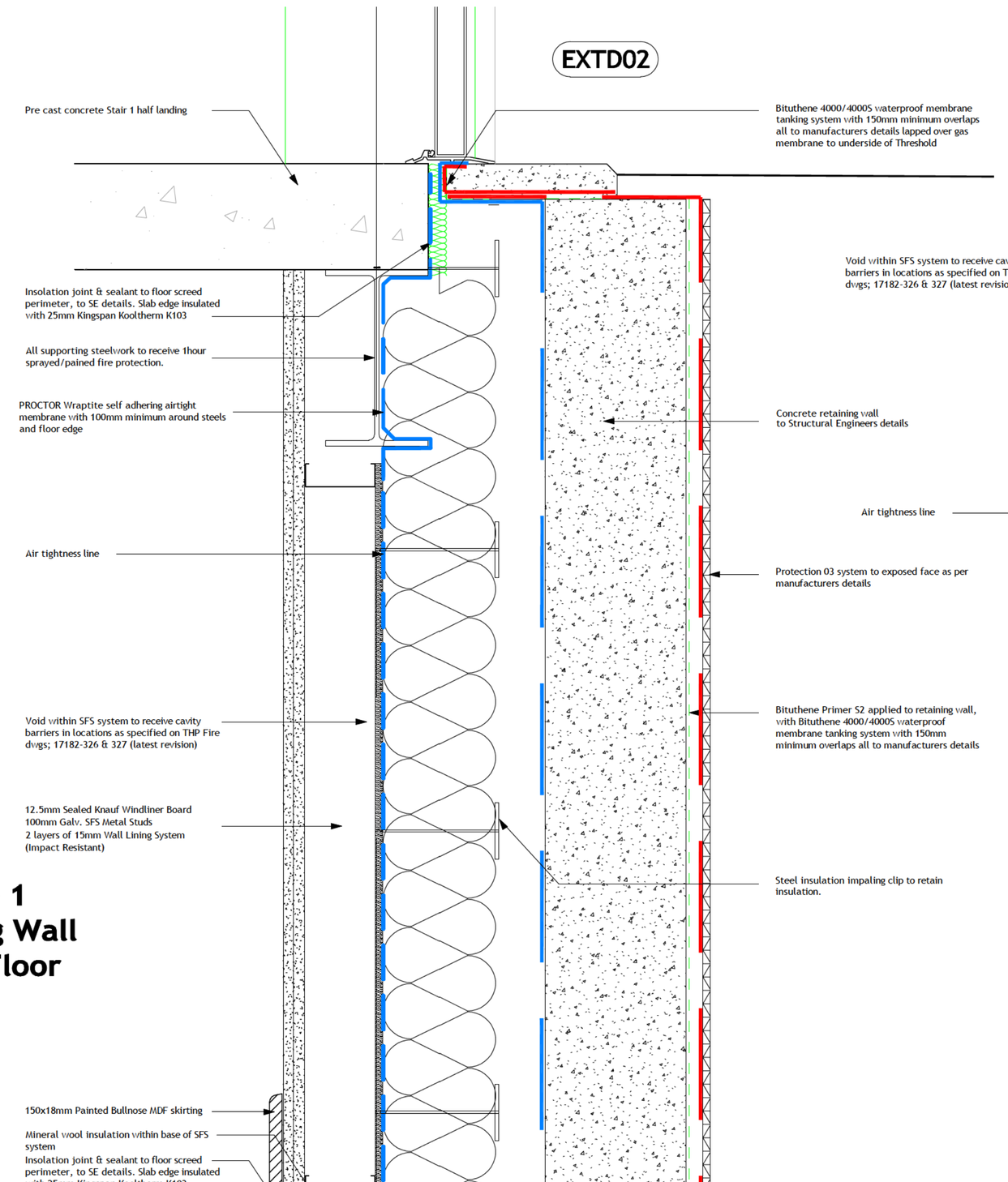


Grid 1 Retaining Wall Head Detail

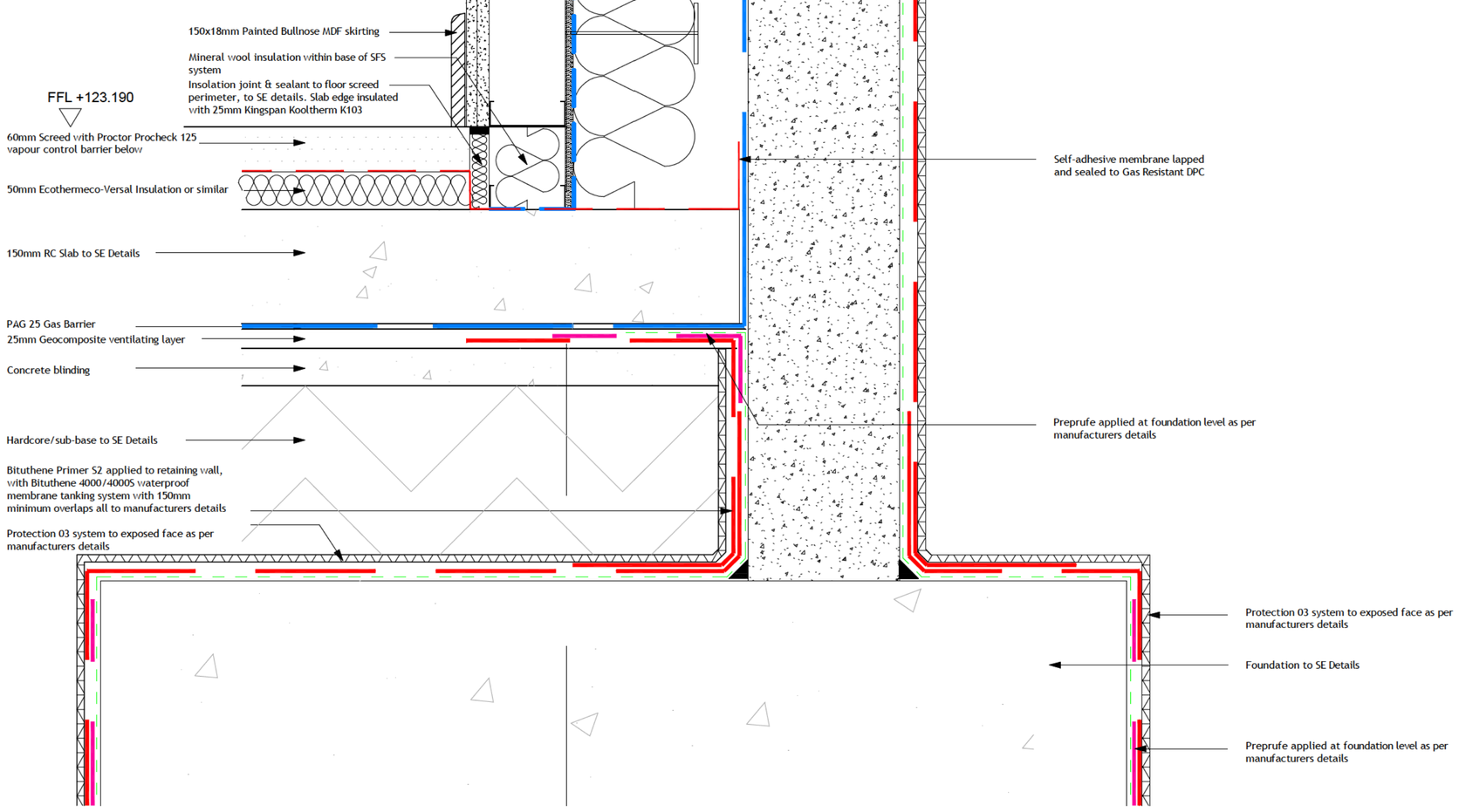


EXTD02

EXTD02



Staircase 1 Retaining Wall Ground Floor Detail



Rev	Date	Description	Rev By	Chk'd
C	10 09 21	Insulation and retaining below cavity tray revised	PRW	MB
B	02 09 21	Insulation retaining cavity tray location revised	PRW	MB
A	11 08 21	Slab extended thro to retaining wall product names revised. Additional retaining wall head detail added.	PRW	MB

Project Title	School Expansion King James's School St Helen's Gate Almondbury Huddersfield HD4 6SG
Client	Esh Construction
Status	CONSTRUCTION
Scale	1:5
Drawing Size	A1
Date	06/21
Drawn By	PRW
Checked	MB
Drawing Title	Detail Section Sheet 2
Job-Dwg No	17182-320
Rev	C

2 St. Johns North
Wakefield WF1 3QA
t. 01924 291800

Carvers Warehouse 77 Dale Street
Manchester M1 2HG
t. 0161 2388555

The Old Rectory 79 High Street
Newport Pagnell MK16 8AB
t. 01908 211577

101 London Road
Reading RG1 5BY
t. 0118 9507700

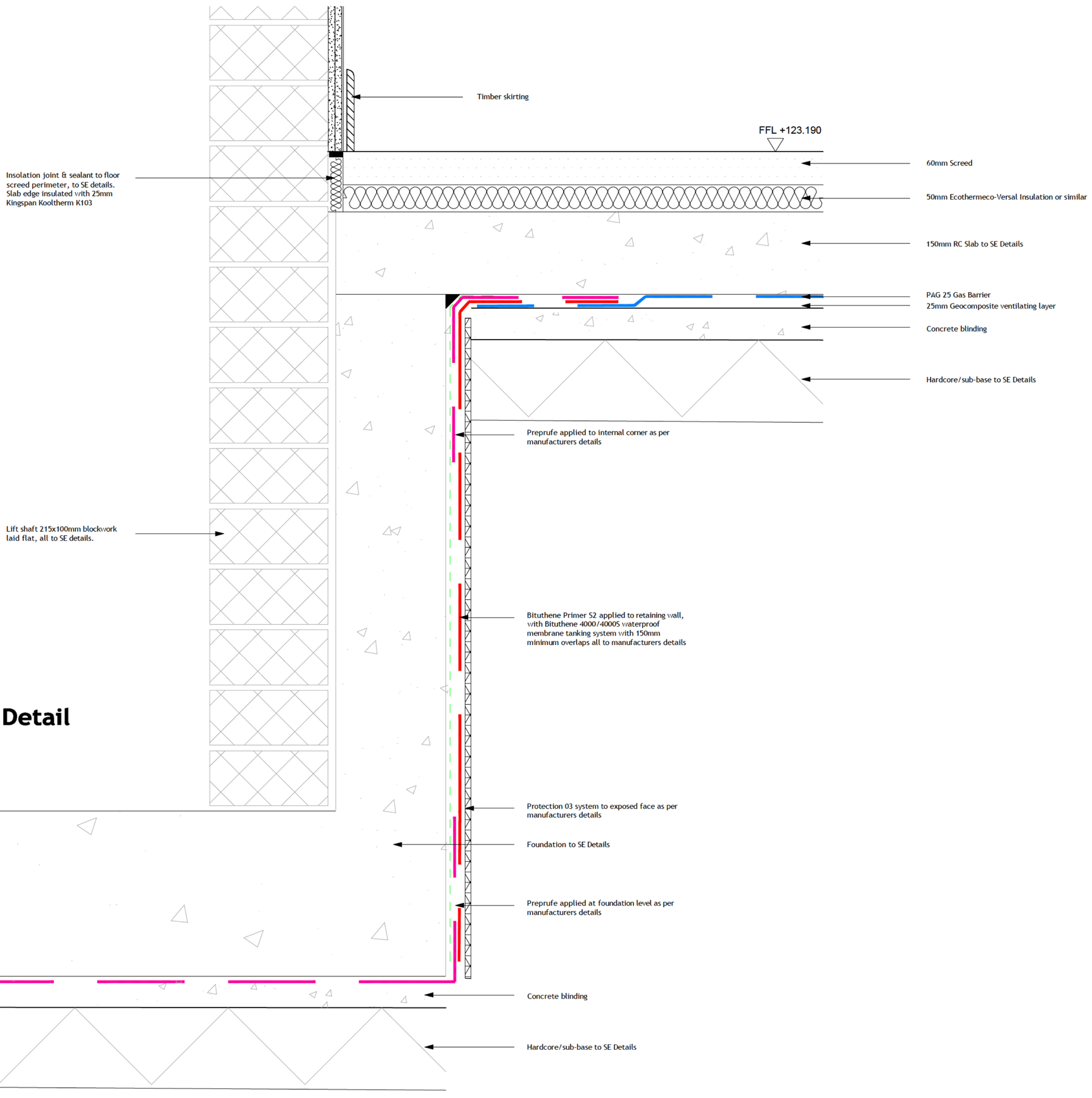
10 Gees Court St Christophers Place
London W1U 1JJ
t. 0207 4091215

THE HARRIS PARTNERSHIP
ARCHITECTS
www.harrispartnership.com

CAD FILE REFERENCE

Refer to SE dwgs and fabrictoctors details for steelwork and floor design.

0 50 100 150 200 250mm
SCALE 1:5



Lift Shaft Detail

Rev	Date	Description	Rev By	Chk'd
-	dd-mm-yy	—	—	—

Project Title	School Expansion King James's School St Helen's Gate Almondbury Huddersfield HD4 6SG
Client	Esh Construction
Status	CONSTRUCTION
Scale	1:5
Drawing Size	A1
Date	07/21
Drawn By	PRW
Checked	MB
Drawing Title	Detail Section Sheet 3
Job-Dwg No	17182-321
Rev	-

2 St. Johns North
Wakefield WF1 3QA
t. 01924 291800

Carvers Warehouse 77 Dale Street
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10 Gees Court St Christophers Place
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CAD FILE REFERENCE

APPENDIX B - VOID FORMER PRODUCT SUMMARY SHEET

Gasflow 25S

creative geosynthetic engineering

Data Sheet

GASFLOW 25S is a geocomposite venting layer comprising a UV-stabilised geotextile filter, thermally bonded on one side of a single cuspated HDPE (High Density Polyethylene) core. Gasflow is suitable for both active and passive venting systems. Its main application is to remove harmful gases such as radon, methane, carbon monoxide, carbon dioxide and hydrogen sulphide from below the base slabs of offices, industrial and commercial buildings. The composite has a flat side in contact with the gas membrane to minimise long term contact stresses.

Geocomposite Properties				
Thickness at 2kPa	(mm)	26.2	±10%	EN ISO 9863-1
Mass per unit area	(g/m^2)	1 670	approx	EN ISO 9864
Tensile strength MD / CMD	(kN/m)	9.5 / 9.5	-13%	EN ISO 10319
Elongation at peak MD / CMD	(%)	40 / 50	nominal	EN ISO 10319
CBR puncture resistance	(N)	3 000	-20%	EN ISO 12236
Ventilation free path	(mm^2/m)	11 500	indicative	
Air Volume	(l/m^2)	18.9	indicative	
Equivalent Void Depth	(mm)	18.9	indicative	
In-plane gas flow MD and CMD		At 5.4Pa		
at 20kPa confining pressure	(l/m·s)	9.0		ASTM D4716-Mod See Note (5)
with **soft foam** contact surfaces to simulate textile intrusion into the core due to soil pressure. The confining pressures of the flow rates shown above are all equal to or less than the long-term compressive strength of the product.				
Resistance to weathering		To be covered in 28 days		EN 12224
Resistance to chemicals		Excellent		EN 14030
Design life		120 years (manufacturer's declaration)		
Geotextile Properties				
Thickness at 2kPa	(mm)	1.2	±20%	EN ISO 9863-1
Tensile strength MD/CMD	(kN/m)	9.5 / 9.5	-13%	EN ISO 10319
Pore size O_{90}	(µm)	120	±30%	EN ISO 12956
CBR puncture resistance	(N)	1 600	-20%	EN ISO 12236
Dynamic perforation cone drop	(mm)	32	+20%	EN ISO 13433
Type and material	Non-woven needle-punched and heat-treated staple fibre polypropylene			
Product Dimensions				
Standard roll dimensions	0.915 m x 50 m. Other sizes on request.			

1 The values given are indicative and correspond to nominal results obtained in our laboratories and testing institutes. In line with our policy of continuous improvement the right is reserved to make changes without notice at any time.
2 Final determination of the suitability of any information is the sole responsibility of the user. ABG will be pleased to discuss the use of this or any other product but responsibility for selection of a material and its application in any specific project remains with the user.
3 The tolerance on roll length is ±1.5% and on roll width is ±1.0%; in multi-core products this may manifest itself between core elements.
4 Guidance on interface shear strength, creep and certain other parameters is available. Site specific tests are strongly recommended.
5 Gas flow values are based on air flow at Normal Temperature and Pressure and are deduced from a programme of gas and water flow testing. ABG will be pleased to advise on flow capacity for other gases under other conditions.

CE
0799-CPR-30

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APPENDIX C - GAS MEMBRANE SPECIFICATION SHEETS

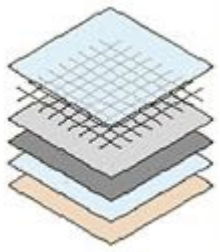
Engineered
Geomembrane
Solutions

01536 740040
office@pageo.co.uk
www.pageo.co.uk

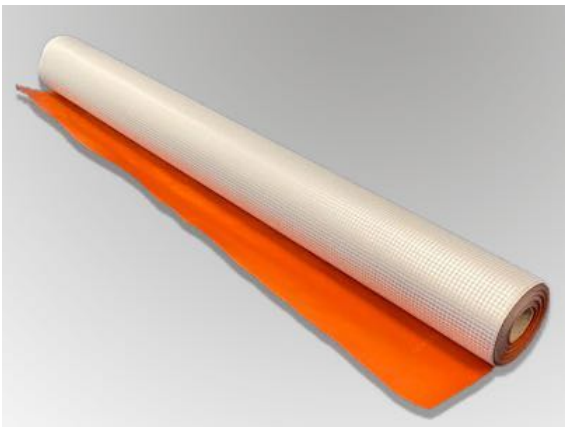
Technical Data Sheet – PAG Standard Gas Barrier

(Rev. Jan 2021)

Methane, Carbon Dioxide and Radon – a high performance Gas Barrier, suitable for some under slab applications.



Top layer	LDPE with stabilizers, Red
Coater Layer	LDPE with stabilizers
Aluminium	12 micron Aluminium layer
Coater Layer	LDPE with stabilizers
Reinforcement	PP, 10 x 10 grid
Bottom Side	LDPE with stabilizers, Silver



- Exceptional flexibility and puncture resistance
- Comprehensively tested with independent validated test results
- Outstanding welding characteristics – efficient installation

Description:

PAG Standard s manufactured from four ayers of v rg n ow-dens ty po yethy ene (LDPE) w th 10mm x 10mm sp t f m po ypropy ene re nforc ng gr d n between to g ve h gh strength and tear res stance. The membrane ncorporates a 12 µm a um n um fo for extreme y ow permeab ty to gases. It a so acts as a h gh performance DPM. The top surface s red n co our and the bottom s s ver.

Deve oped n the ear y 2000 s PAG Standard has been an acknow edged market eader n h gh performance qua ty spec f c membranes. Improved n 2019 to exceed the recommended gauge gu dance n BS8485:2015+A1:2019. It s a mu t -fo membrane w th a re nforc ng scr m and a um n um ayer. PAG Standard s eas y jo ned by a therma we d ng mach nes.

Applications:

PAG Standard s su tab e for the fo ow ng app cat ons:

- Carbon d ox de and methane affected s tes n accordance w th BS8485:2015+A1:2019 & NHBC
- Radon affected s tes n accordance w th BRE211:2015
- Damp protect on n accordance w th Bu d ng Regu at ons Part C.

Approvals & Standards:

■ BS8485:2015+A1:2019 – Code of pract ce for the des gn of protect ve measures for methane and carbon d ox de ground gases for new bu d ngs. Passed the str ngent methane 40m /m /day/atm (ISO15105-1 to BS8485:2015+A1:2019 requ rement) thresho d and phys ca property requ rements.

■ CE Mark EN13967 – Mo sture Barr er Type A. F ex b e sheets for waterproof ng. P ast c and rubber damp proof sheets nc ud ng p ast c and rubber basement tank ng sheet.

Moisture Barrier Type A – EN 13967

Technical Data:

PROPERTIES	MD/CD	UNIT	VALUE	STANDARD
Basis Weight		g/m^2	410	EN 1849 - 2
Tensile strength	MD	N/50mm	650	EN 12311-1
	CD	N/50mm	550	EN 12311-1
Elongation	MD	%	30	EN 12311-1
	CD	%	30	EN 12311 - 1
Nail Tear Resistance	MD	N	320	EN 12310 - 1
	CD	N	380	EN 12310 – 1
Puncture Resistance	kN		1.25	EN 12236
Water Column		Cm	>420	EN20811
Resistance to water Penetration	Class		W1	EN 13859 - 1, EN 1928 Method A
Water Tightness			Pass	EN 1296, EN1367, EN 1928
Fire Resistance	Class		E	CSN EN 13501 -1
Permeability				
Methane		$m/m^2/day/atm$	< 0.09	ISO 15105 - 1
Carbon Dioxide		$m/m^2/day/atm$	< 0.09	ISO 15105 - 1
Radon		M^2/s	8.0×10^{-15}	K124/02/95
Roll size	Width	m	2	EN 1848 - 2
	Length	m	25	EN 1848 - 2

System Components:

- PAG SAGR - Se f Adhes ve Gas Res stant Membrane
- PAG Cross L nked Buty Sea ant
- PAG Pr mer

(P ease note that the membrane can be we ded as a preferred a ternat ve to us ng tape)

NBS Specification:

PAG Standard s spec f ed us ng the fo ow ng:
C ause: J40/145
Product: PAG Standard Gas Barr er
Supp er: PAGeoTechn ca Ltd, Darw n House, Corby Gate Bus ness Park, Corby, NN17 5JG.

Roll Sizing & Weight:

2m x 25m ($50m^2$)
22 kg - hence appropr ate care and equ pment s requ red for un oad ng and hand ng.

Storage and Handling:

C ass f ed as non-hazardous when used n accordance w th the re evant Br t sh Standards. The product s chem ca y nert and s not affected by ac ds and a ka s that may be present n the sub-so s.
Ro s are wrapped nd v dua y n shr nk-wrap po ythene. Each ro bears a product descr pt on abe . Ro s shou d be stored on the r s de, under cover and on a f at, eve surface, and protected from mechan ca damage and heat sources. Dur ng storage exposure to d rect sun ght s to be avo ded.

PAGeoTechnical

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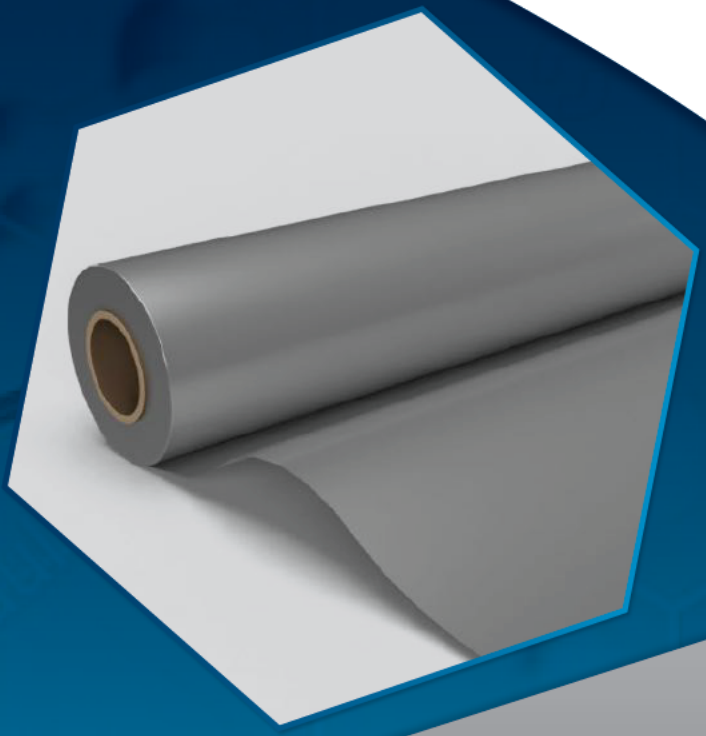
Registered in England and Wales No 4120437 Registered o ice as above

RHINOPLAST EVOLUTION

HYDROCARBON GAS BARRIER



Coverage - 100m²

400mu Thickness

Silver Colour

Rhinoplast Evolution is a high specification co-extruded multi-layer barrier specifically developed for use on construction sites contaminated by Volatile Organic Compounds, Hydrocarbons and other ground gasses such as Methane, Radon and CO2.

The product is 14 layers and contains 2 layers of gas barrier polymer (EVOH) to offer exceptional performance and prevent the ingress of dangerous gasses into buildings. It is manufactured using the latest co-extrusion technology and cannot delaminate. The product will also act as a damp-proof membrane.

The membrane is manufactured using High Performance engineering Polymers to give exceptional strength and does not require reinforcement. It can be installed by the use of sealing tapes or can easily be welded.

A NEW GENERATION OF GAS BARRIER

- Advanced Fourteen Layer Barrier
- Two layers of Ethylene Vinyl Alcohol Co-Polymer (EVOH)
- Outstanding Gas Resistance
- Conforms with BS8485:2015 + A1:2019 (Table 7)
- Conforms to the specification requirements of NHBC Amber 1 & Amber 2 applications
- Suitable for all characteristic Gas Situation (CS) ground gas regimes
- Excellent Welding Characteristics

Web: www.pbpltd.co.uk | Tel: 01709728150

Principal Building Products Ltd, Barbot Hall Ind Est. Mangham Road, Rotherham. S614RJ

Technical Data

Material Properties	Test Method	Value	
Thickness (µm)	N/A	400µm	+/- 6%
Width (mm)	N/A	1.65m	+6mm/-0mm
Length (mm)	N/A	61m	+6mm/-0mm
Repeat Tolerance (mm)	N/A	n/a	
Dynamic C.O.F	BS 2782-824A	0.4 +/- 0.1	
Tensile break force (%)	ASTM D882 / DIN 53455	MD >160	TD >175
Tensile strength @ break (%) MPA	ASTM D882 / DIN 53455	MD >16	TD >16
Elongation Break (%)	ASTM D882 / DIN 53455	MD >500	TD >550
Slow Puncture deflection (mm)	3mm radius	> 3	
Slow Puncture force (N)	3mm radius	> 30	
Density (nominal) (g/cm³)	-	0.957 g/cm³	
Unit Weight (g/m²)	-	382.8	
Sealing Range	RFM 8	110°C - 150°C	

Barrier Properties*	Test Method	Value
OTR	ASTM F 1927, 20 °C 60% RH	Less than 0.75 cc
WVTR	ASTM F 1249, 38 °C 90% RH	Less than 2.0g

Methane Transmission Data

Test	Standard	Unit	Result
Determination of gas transmission rate* Test gas: Methane (CH_4) Gas permeability at 23 °C / 0 % r.H. Gas permeability at 23 °C / 0 % r.H.	ISO 15105-1 10.2007	 $cm^3/(m^2d.bar)$ $ml/(m^2d.atm)$	 ≤ 0,09 ≤ 0,09

* This test was performed in an external laboratory

BS8485:2015+A1:2019

Meets all the following criteria:

- Sufficiently impervious to the gases with a methane gas transmission rate <40.0 ml/day/ m²/atm (average) for sheet and joints (tested in accordance with BS ISO 15105-1 manometric method)
- Sufficiently durable to remain serviceable for the anticipated life of the building and duration of gas emissions
- Sufficiently strong to withstand in-service stresses (e.g settlement if placed below floor slab)
- Sufficiently strong to withstand the installation process and following trades until covered (e.g penetration from steel fibres in fibres reinforced concrete, penetration of reinforcement ties, tearing due to working above it, dropping tools, etc)
- Capable, after installation, of providing a complete barrier to the entry of the relevant gas

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Principal Building Products Ltd, Barbot Hall Ind Est. Mangham Road, Rotherham. S614RJ

PrinciPal
BUILDING PRODUCTS

Data Sheet

Rhinoplast LT Joint Strip

Description

A double sided sealing and jointing tape for use with all polythenes, particularly gas barriers to form a permanent seal. The product is designed to remain tacky at temperatures as low as 0°C.

Two seperate inter leaves are present. These are removed prior to application.

Property	Test method	Units	Data
Dimensions			
Adhesive thickness	-	mm	2.00
Total thickness	-	mm	2.10
Width	-	mm	50
Length	-	m	15
Weight	-	kg/m²	2.15
Application Temperature			
Maximum		°C	30
Minimum		°C	5
Functional Data			
Adhesion (180° Peel)	ASTM D1000	N/mm	2.0
Water Vapour Transmission	ASTM E96	g/m²/24h	1.00

Principal Building Products Ltd, Barbot Hall Industrial Estate, Mangham Road, Rotherham, S61 4RJ, Telephone: 01709 728150 Email: sales@pbpltd.co.uk

APPENDIX D - PHOTOGRAPHIC RECORD

Photographic Record

Plate 1: Lift shaft formed (11/08/2021)

Plate 2: Pre-cut gas membrane sections for around steel columns (11/08/2021)

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Building Environment Consultants

Appendix D

Site: King James' School, Almondbury

Client: Esh Construction Ltd

Job No: 574010

Photographic Record

Plate 3: Section of gas membrane laid beneath internal concrete steps (11/08/2021)

Plate 4: First three rows of void former laid (11/08/2021)

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Building Environment Consultants

Appendix D

Site: King James' School, Almondbury

Client: Esh Construction Ltd

Job No: 574010

Photographic Record

Plate 5: Beginning installation of gas resistant membrane (12/08/2021)

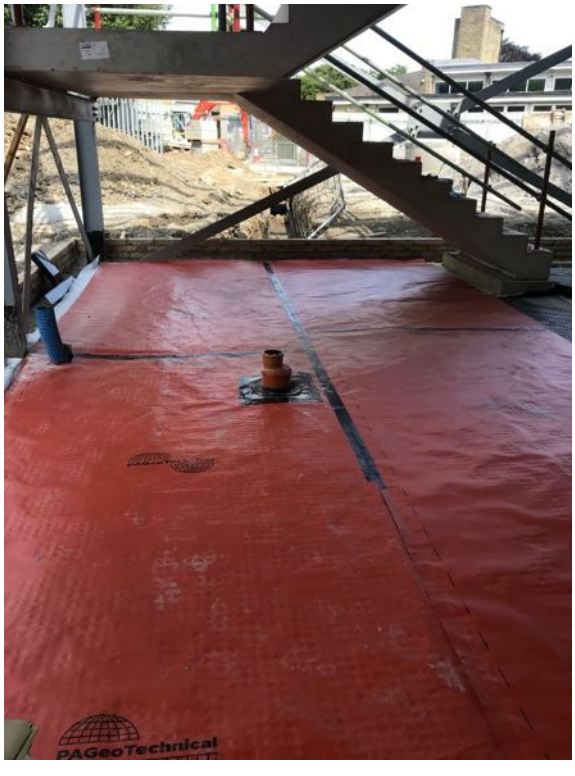

Plate 6: Showing detail around service entries (12/08/2021)

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Appendix D

Site: King James' School, Almondbury

Client: Esh Construction Ltd

Job No: 574010

Photographic Record

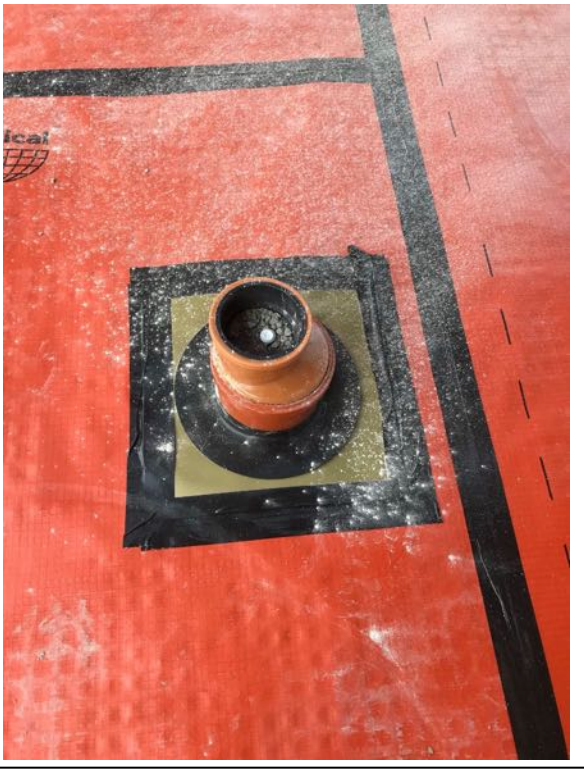

Plate 7: Close-up of service entry sealing (12/08/2021)

Plate 8: Void former installed across north half of building (13/08/2021)

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Building Environment Consultants

Appendix D

Site: King James' School, Almondbury

Client: Esh Construction Ltd

Job No: 574010

Photographic Record

Plate 9: Close-up of joint sealed using SAP Butyl reinforced sealant (13/08/2021)

Plate 10: PAG membrane taken over membrane under internal stairs (13/08/2021)

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Building Environment Consultants

Appendix D

Site: King James' School, Almondbury

Client: Esh Construction Ltd

Job No: 574010

Photographic Record

Plate 11: Rhinoplast membrane installed in lift pit & lapped over (13/08/2021)

Plate 12: Example of pre-cut gas membrane placed over service entries (13/08/2021)

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Appendix D

Site: King James' School, Almondbury

Client: Esh Construction Ltd

Job No: 574010

Photographic Record

Plate 13: Service entry following rubber top hat & sealing (13/08/2021)

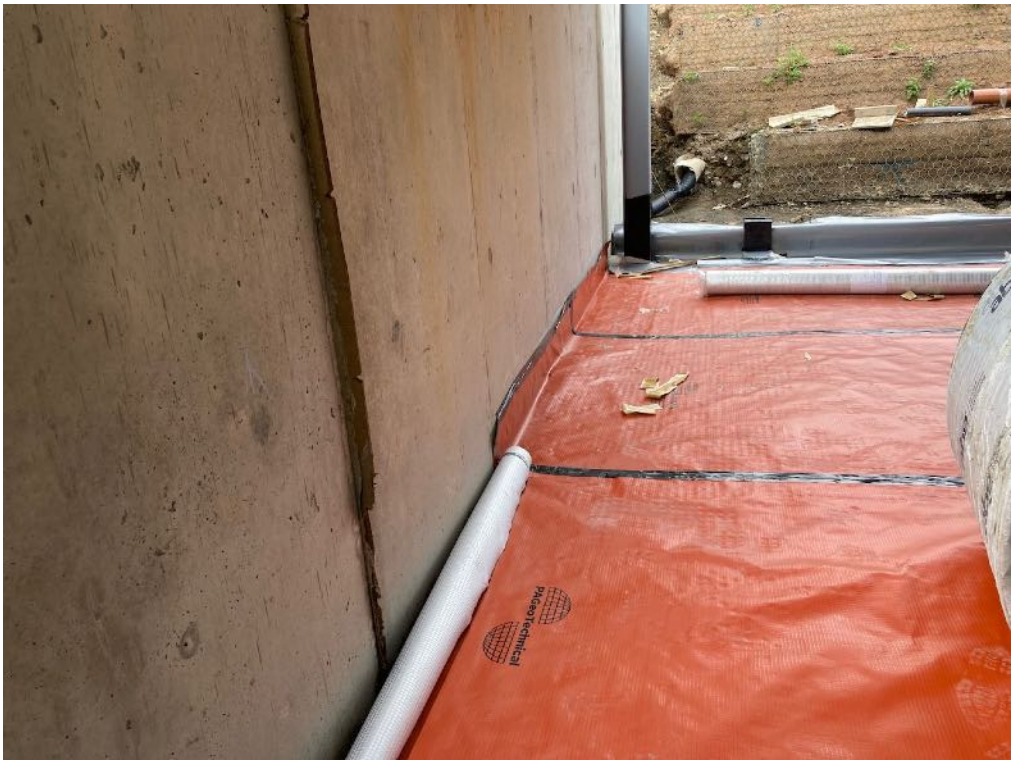

Plate 14: Gas membrane lapped over onto retaining wall (16/08/2021)

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Appendix D

Site: King James' School, Almondbury

Client: Esh Construction Ltd

Job No: 574010

Photographic Record

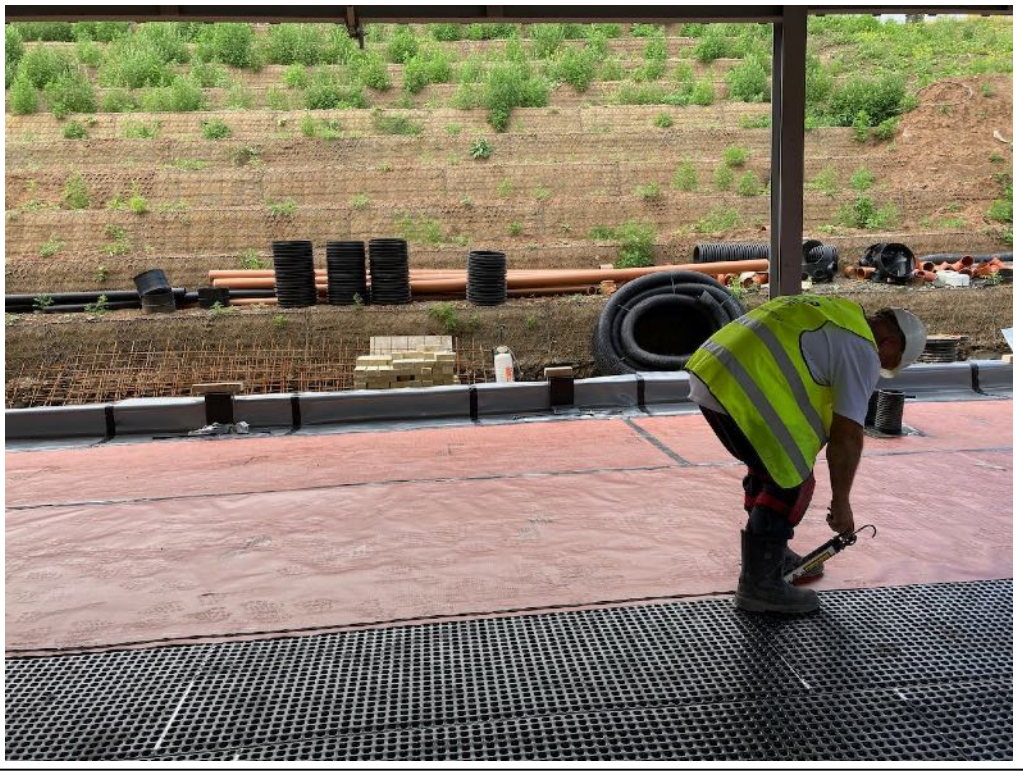

Plate 15: Reinforced Butyl sealant being applied along membrane joints (16/08/2021)

Plate 16: Membrane rolled out over butyl sealant (16/08/2021)

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Appendix D

Site: King James' School, Almondbury

Client: Esh Construction Ltd

Job No: 574010

Photographic Record

Plate 17: Membrane in front of NW internal staircase damage on front face (16/08/2021)

Plate 18: Sealing around internal steel columns (26/08/2021)

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Appendix D

Site: King James' School, Almondbury

Client: Esh Construction Ltd

Job No: 574010

Photographic Record

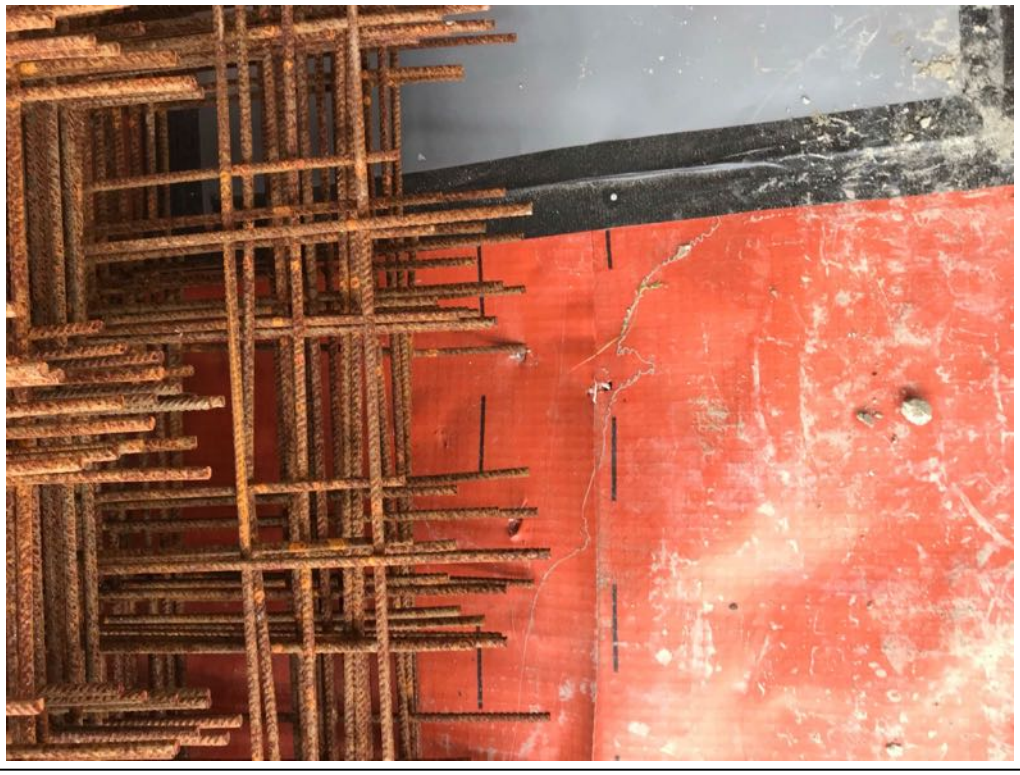

Plate 19: Localised damage to membrane from mesh reinforcement (26/08/2021)

Plate 20: Local repair of gas membrane where scratched by mesh (26/08/2021)

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Appendix D

Site: King James' School, Almondbury

Client: Esh Construction Ltd

Job No: 574010

Photographic Record

Plate 21: Membrane placed across whole footprint area (01/09/2021)

Plate 22: Mesh stored on timbers after previous damages noted (01/09/2021)

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Appendix D

Site: King James' School, Almondbury

Client: Esh Construction Ltd

Job No: 574010

Photographic Record

Plate 23: Risers for mesh reinforcement placed over membrane (01/09/2021)

Plate 24: Gas membrane lapped over first step of internal stairs (01/09/2021)

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Building Environment Consultants

Appendix D

Site: King James' School, Almondbury

Client: Esh Construction Ltd

Job No: 574010

APPENDIX E - SITE INSPECTION PRO FORMA SHEETS

A5 Verification pro formas and worked examples

VISUAL INSPECTION OF GAS PROTECTION MEASURES

Site name: King James' School	Gas characteristic situation: CS2
Job number: 574010	Type of development and building/block checked: (residential/commercial/other) School - classroom block
Date: 11/08/2021	Building description: new classroom block
Visit by: R. Saville	Foundation type: (suspended floor/raft/other) columns & pads - solid floor
Weather at time of inspection: overcast, dry, warm	Gas protection type: passive/active passive w/void former

No.	Item	Comments (see notes)
1	***Gas membrane***	
1.1	Condition of sub-grade and underside of gas membrane	rolled formation before placement of 25mm geocomposue void former
1.2	Gas membrane type	PAG Standard & Rhunoplast Evolution
1.3	Gas membrane condition	N/A - not installed yet, still in sealed rolls
1.4	Joining tape product	SAP butyl sealant or Rhunoplast joint tape
1.5	Lapping design	Will be min. 150mm & marked out
1.6	Laps, welds and joints seals	SAP butyl sealant for joins & laps taped down
1.7	Service entries seals	Pre-cut squares of gas membrane, flexible rubber covers & butyl sealant to be used
2	***Passive venting***	
2.1	Sub-floor void	25mm geocomposue void former
2.2	External wall airbricks	Plastic airbricks & telescopic vents.
2.3	Internal sleeper walls	N/A
2.4	External vent trenches/ducts	N/A
3	***Active venting***	
3.1	System details	N/A

Additional notes:
Toolbox talk / discussion w/ site manager re: restricting access to area once membrane installation starts.

Notes: inspection checklist

1.1	Underside of gas membrane	Check that the sub grade 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.
1.2	Gas membrane type	Manufacturer and product specification, gauge, colour, brand/name, material batch/roll numbers, storage arrangements (protected from dirt/damage?)
1.3	Gas membrane condition	Open punctures, tears, rips, stretching? Excessive footprints/evidence of traffic? Presence of debris? Repairs? Signs of weakness such as raised or sunken indentations? Protection plan in place to restrict access to lain gas membrane?
1.4	Joining tape product	Product type, brand, thickness, material, width, colour? Use of double sided tape?
1.5	Lapping design	Joints lapped and sealed in accordance with manufacturer's requirements/ specification? Minimum overlap insured? Sections taped twice?
1.6	Laps and joints sealed	Welds complete? Appropriate joining/double sided tape used?
1.7	Service entries sealed	Top hats seal arrangements fixed around service entries? Use of Jubilee clips?
2.1	Sub-floor void	Is a check possible? Void former? Gravel (type/specification)? Height of void space? Is it clear?
2.2	External wall airbricks	Numbers, size, positions as design drawing?
2.3	Internal sleeper walls	Ventilation holes (honeycomb brickwork/pipe crossings?) – size, spacing, location in accordance with design?
2.4	External vent trenches/ducts	Located and constructed in accordance with design drawings? If open-topped gravel – gravel type/presence of fines? If pipe or other vent, check position and construction for functionality and absence of blockages. Ability of void former to withstand bearing of the superstructure?
3.1	Active venting	Type of air supply: mechanical, natural, combined? Location/condition/number of fans and vents? Location and size of inlets? Provision of air-cleaning devices and air heaters? Supply and exhaust ductwork? Alarm provision/installation? Gas monitoring system in under-floor void?

Photographs

No.	Description

The gas protection measures inspected:	(a) Are acceptable and comply with the specification
	b Are acceptable but attention is drawn to issues related to item no. xxx
	c Are not acceptable due to the issues related to item no. xxx

Name: Richard Saville **Signature:** R. Saville **Date:** 11/08/2021

A5 Verification pro formas and worked examples

VISUAL INSPECTION OF GAS PROTECTION MEASURES

Site name: King James School	Gas characteristic situation: CS2
Job number: 574010	Type of development and building/block checked: (residential/commercial/other) School - classroom block
Date: 12/08/2021	Building description: Portal frame - new classroom block
Visit by: Rachel Ziabek	Foundation type: (suspended floor/raft/other) Pads for columns - Solid floor
Weather at time of inspection: Dry, warm, sunny	Gas protection type: passive/active passive with void former

No.	Item	Comments (see notes)
1	***Gas membrane***	
1.1	Condition of sub-grade and underside of gas membrane	rolled formation before placement of 25mm geocomposite void former.
1.2	Gas membrane type	PAG standard and rhinoplast evolution
1.3	Gas membrane condition	Good - first 2 sections laid.
1.4	Joining tape product	SAP butyl sealant
1.5	Lapping design	150mm and laps taped down
1.6	Laps, welds and joints seals	SAP butyl sealant + laps taped down
1.7	Service entries seals	Pre-cut squares of gas membrane and sealed using butyl sealant. Flexible rubber hood
2	***Passive venting***	
2.1	Sub-floor void	25mm geocomposite void former
2.2	External wall airbricks	plastic air bricks and telescopic vents
2.3	Internal sleeper walls	N/A
2.4	External vent trenches/ducts	N/A
3	***Active venting***	
3.1	System details	N/A

Additional notes: Continue to lay gas membrane across northern half of building

Notes: inspection checklist

1.1	Underside of gas membrane	Check that the sub grade 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.
1.2	Gas membrane type	Manufacturer and product specification, gauge, colour, brand/name, material batch/roll numbers, storage arrangements (protected from dirt/damage?)
1.3	Gas membrane condition	Open punctures, tears, rips, stretching? Excessive footprints/evidence of traffic? Presence of debris? Repairs? Signs of weakness such as raised or sunken indentations? Protection plan in place to restrict access to lain gas membrane?
1.4	Joining tape product	Product type, brand, thickness, material, width, colour? Use of double sided tape?
1.5	Lapping design	Joints lapped and sealed in accordance with manufacturer's requirements/ specification? Minimum overlap insured? Sections taped twice?
1.6	Laps and joints sealed	Welds complete? Appropriate joining/double sided tape used?
1.7	Service entries sealed	Top hats seal arrangements fixed around service entries? Use of Jubilee clips?
2.1	Sub-floor void	Is a check possible? Void former? Gravel (type/specification)? Height of void space? Is it clear?
2.2	External wall airbricks	Numbers, size, positions as design drawing?
2.3	Internal sleeper walls	Ventilation holes (honeycomb brickwork/pipe crossings?) – size, spacing, location in accordance with design?
2.4	External vent trenches/ducts	Located and constructed in accordance with design drawings? If open-topped gravel – gravel type/presence of fines? If pipe or other vent, check position and construction for functionality and absence of blockages. Ability of void former to withstand bearing of the superstructure?
3.1	Active venting	Type of air supply: mechanical, natural, combined? Location/condition/number of fans and vents? Location and size of inlets? Provision of air-cleaning devices and air heaters? Supply and exhaust ductwork? Alarm provision/installation? Gas monitoring system in under-floor void?

Photographs

No.	Description

The gas protection measures inspected:	(a) Are acceptable and comply with the specification
	b Are acceptable but attention is drawn to issues related to item no. xxx
	c Are not acceptable due to the issues related to item no. xxx

Name: Rachel Ziabek **Signature:** RZiabek. **Date:** 12/08/2021

A5 Verification pro formas and worked examples

VISUAL INSPECTION OF GAS PROTECTION MEASURES

Site name: King James' School	Gas characteristic situation: CS2
Job number: 574010	Type of development and building/block checked: (residential/commercial/other) School - classroom block
Date: 13/08/2021	Building description: portal frame, new classroom block
Visit by: R. Saville	Foundation type: (suspended floor/raft/other) pads for columns - solid floor
Weather at time of inspection: Sunny, dry, warm	Gas protection type: passive/active passive w/ void former

No.	Item	Comments (see notes)
1	***Gas membrane***	
1.1	Condition of sub-grade and underside of gas membrane	rolled formation before placement of 25mm geocomposite void former.
1.2	Gas membrane type	PAG Standard gas barrier (main floor) & Rhinoplast Evolution Hydrocarbon barrier
1.3	Gas membrane condition	Good - laid first 2 sections of membrane
1.4	Joining tape product	SAP butyl reinforced sealant
1.5	Lapping design	150mm (min) & laps taped down
1.6	Laps, welds and joints seals	SAP butyl sealant & laps taped down.
1.7	Service entries seals	Pre-cut sausages of gas membrane & sealed using butyl sealant. Flexible rubber hood.
2	***Passive venting***	
2.1	Sub-floor void	25mm geocomposite void former
2.2	External wall airbricks	plastic air bricks & telescopic vents
2.3	Internal sleeper walls	N/A
2.4	External vent trenches/ducts	N/A
3	***Active venting***	
3.1	System details	N/A
Additional notes: Continuing to lay gas membrane across northern half of building now void former lain.		

Notes: inspection checklist

1.1	Underside of gas membrane	Check that the sub grade 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.
1.2	Gas membrane type	Manufacturer and product specification, gauge, colour, brand/name, material batch/roll numbers, storage arrangements (protected from dirt/damage?)
1.3	Gas membrane condition	Open punctures, tears, rips, stretching? Excessive footprints/evidence of traffic? Presence of debris? Repairs? Signs of weakness such as raised or sunken indentations? Protection plan in place to restrict access to lain gas membrane?
1.4	Joining tape product	Product type, brand, thickness, material, width, colour? Use of double sided tape?
1.5	Lapping design	Joints lapped and sealed in accordance with manufacturer's requirements/ specification? Minimum overlap insured? Sections taped twice?
1.6	Laps and joints sealed	Welds complete? Appropriate joining/double sided tape used?
1.7	Service entries sealed	Top hats seal arrangements fixed around service entries? Use of Jubilee clips?
2.1	Sub-floor void	Is a check possible? Void former? Gravel (type/specification)? Height of void space? Is it clear?
2.2	External wall airbricks	Numbers, size, positions as design drawing?
2.3	Internal sleeper walls	Ventilation holes (honeycomb brickwork/pipe crossings?) – size, spacing, location in accordance with design?
2.4	External vent trenches/ducts	Located and constructed in accordance with design drawings? If open-topped gravel – gravel type/presence of fines? If pipe or other vent, check position and construction for functionality and absence of blockages. Ability of void former to withstand bearing of the superstructure?
3.1	Active venting	Type of air supply: mechanical, natural, combined? Location/condition/number of fans and vents? Location and size of inlets? Provision of air-cleaning devices and air heaters? Supply and exhaust ductwork? Alarm provision/installation? Gas monitoring system in under-floor void?

Photographs

No.	Description

The gas protection measures inspected:	(a) Are acceptable and comply with the specification
	b Are acceptable but attention is drawn to issues related to item no. xxx
	c Are not acceptable due to the issues related to item no. xxx

Name: Richard Saville **Signature:** R. Saville **Date:** 13/08/2021

A5 Verification pro formas and worked examples

VISUAL INSPECTION OF GAS PROTECTION MEASURES

Site name: King James' School	Gas characteristic situation: CS2
Job number: 574010	Type of development and building/block checked: (residential/ commercial/other) School
Date: 16/08/2021	Building description: Portal Frame - new classroom block
Visit by: R. Saville	Foundation type: (suspended floor/raft/other) Pads for columns - solid floor
Weather at time of inspection: sunny, dry, warm	Gas protection type: passive/active passive w/ void former

No.	Item	Comments (see notes)
1	***Gas membrane***	
1.1	Condition of sub-grade and underside of gas membrane	Gas membrane installed on top of void former
1.2	Gas membrane type	PAG Standard & Rhinoplast Evolution
1.3	Gas membrane condition	Good
1.4	Joining tape product	SAP butyl reinforced sealant
1.5	Lapping design	150mm (min) & laps taped down
1.6	Laps, welds and joints seals	SAP butyl sealant & laps taped down
1.7	Service entries seals	Pre-cut squares of gas membrane & butyl sealant - Flexible rubber hood.
2	***Passive venting***	
2.1	Sub-floor void	25mm geocomposite void former
2.2	External wall airbricks	plastic air bricks & telescopic vents.
2.3	Internal sleeper walls	N/A
2.4	External vent trenches/ducts	N/A
3	***Active venting***	
3.1	System details	N/A

Additional notes: Gas membrane by NE internal staircase to be lapped onto bottom step as existing membrane was scuffed when inspected. Agreed w/ contractor.

Notes: inspection checklist

1.1	Underside of gas membrane	Check that the sub grade 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.
1.2	Gas membrane type	Manufacturer and product specification, gauge, colour, brand/name, material batch/roll numbers, storage arrangements (protected from dirt/damage?)
1.3	Gas membrane condition	Open punctures, tears, rips, stretching? Excessive footprints/evidence of traffic? Presence of debris? Repairs? Signs of weakness such as raised or sunken indentations? Protection plan in place to restrict access to lain gas membrane?
1.4	Joining tape product	Product type, brand, thickness, material, width, colour? Use of double sided tape?
1.5	Lapping design	Joints lapped and sealed in accordance with manufacturer's requirements/ specification? Minimum overlap insured? Sections taped twice?
1.6	Laps and joints sealed	Welds complete? Appropriate joining/double sided tape used?
1.7	Service entries sealed	Top hats seal arrangements fixed around service entries? Use of Jubilee clips?
2.1	Sub-floor void	Is a check possible? Void former? Gravel (type/specification)? Height of void space? Is it clear?
2.2	External wall airbricks	Numbers, size, positions as design drawing?
2.3	Internal sleeper walls	Ventilation holes (honeycomb brickwork/pipe crossings?) – size, spacing, location in accordance with design?
2.4	External vent trenches/ducts	Located and constructed in accordance with design drawings? If open-topped gravel – gravel type/presence of fines? If pipe or other vent, check position and construction for functionality and absence of blockages. Ability of void former to withstand bearing of the superstructure?
3.1	Active venting	Type of air supply: mechanical, natural, combined? Location/condition/number of fans and vents? Location and size of inlets? Provision of air-cleaning devices and air heaters? Supply and exhaust ductwork? Alarm provision/installation? Gas monitoring system in under-floor void?

Photographs

No.	Description

The gas protection measures inspected:	a Are acceptable and comply with the specification
	b Are acceptable but attention is drawn to issues related to item no. xxx
	c Are not acceptable due to the issues related to item no. xxx

Name: Richard Saville **Signature:** R. Saville **Date:** 16/08/2021

A5 Verification pro formas and worked examples

VISUAL INSPECTION OF GAS PROTECTION MEASURES

Site name: King James School	Gas characteristic situation: CS2
Job number: 574010	Type of development and building/block checked: (residential/ commercial/other) New classroom block
Date: 20/08/2021	Building description: Portal frame - new classroom block
Visit by: Rachel Ziabek	Foundation type: (suspended floor/raft/other) Pads for columns, Solid floor
Weather at time of inspection: Dry, warm, cloudy	Gas protection type: passive/active Passive with void former

No.	Item	Comments (see notes)
1	***Gas membrane***	
1.1	Condition of sub-grade and underside of gas membrane	Gas membrane installed on top of void former
1.2	Gas membrane type	PAG Standard + rhinoplast evolution
1.3	Gas membrane condition	Good
1.4	Joining tape product	SAP butyl sealant + laps taped down
1.5	Lapping design	150mm overlap + laps taped down
1.6	Laps, welds and joints seals	SAP butyl sealant + laps taped down.
1.7	Service entries seals	Pre-cut squares of gas membrane, sealed with butyl sealant and flexible rubber hoods
2	***Passive venting***	
2.1	Sub-floor void	25mm geocomposite void former
2.2	External wall airbricks	plastic air bricks and telescopic vents
2.3	Internal sleeper walls	N/A
2.4	External vent trenches/ducts	N/A
3	***Active venting***	
3.1	System details	N/A

Additional notes: Continue to lay gas membrane across Southern half of building.

Notes: inspection checklist

1.1	Underside of gas membrane	Check that the sub grade 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.
1.2	Gas membrane type	Manufacturer and product specification, gauge, colour, brand/name, material batch/roll numbers, storage arrangements (protected from dirt/damage?)
1.3	Gas membrane condition	Open punctures, tears, rips, stretching? Excessive footprints/evidence of traffic? Presence of debris? Repairs? Signs of weakness such as raised or sunken indentations? Protection plan in place to restrict access to lain gas membrane?
1.4	Joining tape product	Product type, brand, thickness, material, width, colour? Use of double sided tape?
1.5	Lapping design	Joints lapped and sealed in accordance with manufacturer's requirements/ specification? Minimum overlap insured? Sections taped twice?
1.6	Laps and joints sealed	Welds complete? Appropriate joining/double sided tape used?
1.7	Service entries sealed	Top hats seal arrangements fixed around service entries? Use of Jubilee clips?
2.1	Sub-floor void	Is a check possible? Void former? Gravel (type/specification)? Height of void space? Is it clear?
2.2	External wall airbricks	Numbers, size, positions as design drawing?
2.3	Internal sleeper walls	Ventilation holes (honeycomb brickwork/pipe crossings?) – size, spacing, location in accordance with design?
2.4	External vent trenches/ducts	Located and constructed in accordance with design drawings? If open-topped gravel – gravel type/presence of fines? If pipe or other vent, check position and construction for functionality and absence of blockages. Ability of void former to withstand bearing of the superstructure?
3.1	Active venting	Type of air supply: mechanical, natural, combined? Location/condition/number of fans and vents? Location and size of inlets? Provision of air-cleaning devices and air heaters? Supply and exhaust ductwork? Alarm provision/installation? Gas monitoring system in under-floor void?

Photographs

No.	Description

The gas protection measures inspected:	(a) Are acceptable and comply with the specification
	b Are acceptable but attention is drawn to issues related to item no. xxx
	c Are not acceptable due to the issues related to item no. xxx

Name: Rachel Ziabek **Signature:** RZiabek **Date:** 20/08/2021

A5 Verification pro formas and worked examples

VISUAL INSPECTION OF GAS PROTECTION MEASURES

Site name: King James School	Gas characteristic situation: CS2
Job number: 574010	Type of development and building/block checked: (residential/commercial/other) School
Date: 26/08/2021	Building description: Portal frame - new classroom block
Visit by: Rachel Ziabek	Foundation type: (suspended floor/raft/other). Pads for Columns - Solid Floor
Weather at time of inspection:	Gas protection type: passive/active Passive with Void former

No.	Item	Comments (see notes)
1	***Gas membrane***	
1.1	Condition of sub-grade and underside of gas membrane	Gas membrane laid on 25mm void former across the entire floor
1.2	Gas membrane type	PAG Standard and Rhinoplast evolution
1.3	Gas membrane condition	Good – Membrane punctured in 2 places. Squares of membrane placed over defects. Sealed and taped.
1.4	Joining tape product	SAP butyl sealant + laps taped down
1.5	Lapping design	150mm overlap and laps taped down
1.6	Laps, welds and joints seals	SAP butyl sealant and laps taped down
1.7	Service entries seals	Pre-cut squares of membrane sealed with butyl sealant and flexible rubber hoods.
2	***Passive venting***	
2.1	Sub-floor void	25mm geocomposite void former
2.2	External wall airbricks	plastic air bricks and telescopic vents
2.3	Internal sleeper walls	N/A
2.4	External vent trenches/ducts	N/A
3	***Active venting***	
3.1	System details	N/A

Additional notes: Membrane damage repaired whilst on site. No other defects noted.

Notes: inspection checklist

1.1	Underside of gas membrane	Check that the sub grade 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.
1.2	Gas membrane type	Manufacturer and product specification, gauge, colour, brand/name, material batch/roll numbers, storage arrangements (protected from dirt/damage?)
1.3	Gas membrane condition	Open punctures, tears, rips, stretching? Excessive footprints/evidence of traffic? Presence of debris? Repairs? Signs of weakness such as raised or sunken indentations? Protection plan in place to restrict access to lain gas membrane?
1.4	Joining tape product	Product type, brand, thickness, material, width, colour? Use of double sided tape?
1.5	Lapping design	Joints lapped and sealed in accordance with manufacturer's requirements/ specification? Minimum overlap insured? Sections taped twice?
1.6	Laps and joints sealed	Welds complete? Appropriate joining/double sided tape used?
1.7	Service entries sealed	Top hats seal arrangements fixed around service entries? Use of Jubilee clips?
2.1	Sub-floor void	Is a check possible? Void former? Gravel (type/specification)? Height of void space? Is it clear?
2.2	External wall airbricks	Numbers, size, positions as design drawing?
2.3	Internal sleeper walls	Ventilation holes (honeycomb brickwork/pipe crossings?) – size, spacing, location in accordance with design?
2.4	External vent trenches/ducts	Located and constructed in accordance with design drawings? If open-topped gravel – gravel type/presence of fines? If pipe or other vent, check position and construction for functionality and absence of blockages. Ability of void former to withstand bearing of the superstructure?
3.1	Active venting	Type of air supply: mechanical, natural, combined? Location/condition/number of fans and vents? Location and size of inlets? Provision of air-cleaning devices and air heaters? Supply and exhaust ductwork? Alarm provision/installation? Gas monitoring system in under-floor void?

Photographs

No.	Description

The gas protection measures inspected:	(a) Are acceptable and comply with the specification
	b Are acceptable but attention is drawn to issues related to item no. xxx
	c Are not acceptable due to the issues related to item no. xxx

Name: Rachel Ziabek **Signature:** RZiabek. **Date:** 26/08/2021

A5 Verification pro formas and worked examples

VISUAL INSPECTION OF GAS PROTECTION MEASURES

Site name: King James' School	Gas characteristic situation: CS2
Job number: 574010	Type of development and building/block checked: (residential/commercial/other) School
Date: 01/09/2021	Building description: portal frame - new classroom block
Visit by: R. Saville	Foundation type: (suspended floor/raft/other) pads for columns - solid floor
Weather at time of inspection: overcast, dry, warm	Gas protection type: passive/active passive w/void former

No.	Item	Comments (see notes)
1	***Gas membrane***	
1.1	Condition of sub-grade and underside of gas membrane	Gas membrane laid on 25mm void former - no signs of protrusions
1.2	Gas membrane type	PAG Standard & Rhinoplast Evolution
1.3	Gas membrane condition	Good - no signs of potential protrusions or damages by follow-on trades.
1.4	Joining tape product	SAP butyl sealant & laps taped down
1.5	Lapping design	150mm (min.) overlap & laps taped down
1.6	Laps, welds and joints seals	SAP butyl sealant & laps taped down.
1.7	Service entries seals	Pre-cut squares of gas membrane, sealed w/ butyl sealant & flexible rubber hoods.
2	***Passive venting***	
2.1	Sub-floor void	25mm geocomposite void former
2.2	External wall airbricks	Plastic air brick & telescopic vents.
2.3	Internal sleeper walls	N/A
2.4	External vent trenches/ducts	N/A
3	***Active venting***	
3.1	System details	N/A

Additional notes: Cast in-situ concrete floor being laid tomorrow; no obvious signs of defects noted. Reinforcing being put into position & finalised whilst on site.

Notes: inspection checklist

1.1	Underside of gas membrane	Check that the sub grade 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.
1.2	Gas membrane type	Manufacturer and product specification, gauge, colour, brand/name, material batch/roll numbers, storage arrangements (protected from dirt/damage?)
1.3	Gas membrane condition	Open punctures, tears, rips, stretching? Excessive footprints/evidence of traffic? Presence of debris? Repairs? Signs of weakness such as raised or sunken indentations? Protection plan in place to restrict access to lain gas membrane?
1.4	Joining tape product	Product type, brand, thickness, material, width, colour? Use of double sided tape?
1.5	Lapping design	Joints lapped and sealed in accordance with manufacturer's requirements/ specification? Minimum overlap insured? Sections taped twice?
1.6	Laps and joints sealed	Welds complete? Appropriate joining/double sided tape used?
1.7	Service entries sealed	Top hats seal arrangements fixed around service entries? Use of Jubilee clips?
2.1	Sub-floor void	Is a check possible? Void former? Gravel (type/specification)? Height of void space? Is it clear?
2.2	External wall airbricks	Numbers, size, positions as design drawing?
2.3	Internal sleeper walls	Ventilation holes (honeycomb brickwork/pipe crossings?) – size, spacing, location in accordance with design?
2.4	External vent trenches/ducts	Located and constructed in accordance with design drawings? If open-topped gravel – gravel type/presence of fines? If pipe or other vent, check position and construction for functionality and absence of blockages. Ability of void former to withstand bearing of the superstructure?
3.1	Active venting	Type of air supply: mechanical, natural, combined? Location/condition/number of fans and vents? Location and size of inlets? Provision of air-cleaning devices and air heaters? Supply and exhaust ductwork? Alarm provision/installation? Gas monitoring system in under-floor void?

Photographs

No.	Description

The gas protection measures inspected:	(a) Are acceptable and comply with the specification
	b Are acceptable but attention is drawn to issues related to item no. xxx
	c Are not acceptable due to the issues related to item no. xxx

Name: Richard Saville **Signature:** R. Saville **Date:** 01/09/2021