

NORTH LIZARD RIDING SCHOOL

REMEDIATION STATEMENT

S2523/03, OCT 2025
ISSUE 3.0



**SPIRE
GEOTECHNICAL**
Geologists &
Site Investigation Specialists

INTRODUCTION

Spire Geotechnical Ltd (SGL) were appointed by Gary Craig Architectural Services Ltd to prepare a Remediation Statement in support of the proposed development being considered at the North Lizard Riding School.

The site is located to the east of Lizard Lane in South Shields. As part of the proposed works, the existing stables will be converted to residential use. A third-party Phase 1 Desk Study report did not identify any significant contamination linkages that would warrant Phase 2 investigation, however as a precautionary measure, ground gas protection was recommended due to the potential presence of offsite ground gas sources.



The following appendices are included with this Remediation Statement:

- Appendix 1: Drawings
- Appendix 2: Inspection of Ground Gas Protection
- Appendix 3: Example Gas Protection Speciation Details
- Appendix 4: Supporting Technical Guidance

REPORT OBJECTIVES

This Remediation Statement report sets out the measures required to install suitable ground gas protection and the methods to verify that the protection measures are correctly installed.

This strategy methodology is based on the following standards:

- BS 8485: 2015+1:2019, 'Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings'.
- CIRIA C735 (2014), 'Good practice on the testing and verification of protection systems for buildings against hazardous ground gases'.

GROUND GAS PROTECTIVE MEASURES

A ground gas risk assessment has not been undertaken as part an intrusive ground investigation. It is understood that ground gas protection will be installed by default within the newly converted building.

Therefore, basic ground gas protection measures are to be installed to the ground gassing regime Characteristic Situation 2 (CS2).

Gas Protection Score & Risks

In accordance with Table 4 of BS 8485-2015+A1:2019, residential end-use equates to Type A Buildings. For CS2 ground gas protection, a minimum points score of 3.5 must be achieved. This can be achieved from a range of measures as described in Section 7 of the British Standard and summarised below:

Score for Structural Barrier:	1.0
Grade 2 Basement:	N/A
Grade 3 Basement:	N/A
Venting below membrane:	1.5
Venting above slab:	N/A
Provided gas resistant membrane:	2.0

Therefore, the above measures will provide/achieve a minimum points score of 4.5 and are considered acceptable in accordance with the British Standard.

For further details on how the above scores will be achieved, the proposed technical details have been presented in Appendix 1 & 3.

In order to achieve the required gas protection score, a Verification Plan has been provided within Appendix 2 and 3. The Verification Plan details:

- Gas protection inspection verification requirements
- Examples specification details of the gas barrier system including ancillary product details (such as GR DPC, use of double sided and lap tape)

To ensure that the gas protection is installed correctly, BS 8485 recommends that the installation is verified in accordance with CIRIA C735. The requirement and scope of gas verification measures is a function of the complexity of the development and is assessed via a risk-based system. For this site, the assessed risks are as follows:

Gassing Regime	CS2	Low Risk
Required Score	3.5	-
Design Complexity	Simple	Low Risk
Installation Requirements	Non-specialised with NVQ Level 2 qualifications in gas protection installation.	High Risk

Based on the CS2 classifications and risks outlined in the above table, it is considered necessary that the inspection of the plot/gassing detail is conducted by an independent technical specialist.

VERIFICATION

For this site, the implementation of the CS2 ground gas protection measures must be witnessed, photographed and validated by an experienced and suitably qualified Engineer to ensure that all works are completed in strict accordance with this Remediation Statement, the proposed design details, BS8485 and C735.

Site Inspection Verification

A site inspection shall validate the emplacement of gas protection measures within the converted structure, as well as confirming that all installation requirements have been met. Typical inspection should follow the criteria set out in C735. The procedure for inspection /validation of the gas protection measures is outlined below:-

- A. The verification of structure will be recorded by the qualified Engineer (to CIRIA C735) to verify that the works have been carried out in full accordance to a design drawing and product specifications.
- B. The visual inspection will be accompanied by a full photographic record. The inspected/photographic record will include (as a minimum) the verification of the following construction details:-
 - The underside of the gas membrane: to assess that no uneven/rough surfaces are present
 - Sub-floor void and telescoping venting to external
 - Gas membrane type: full product/manufacturers specification, gauge, colour, batch/roll number
 - Gas membrane condition: to assess that there are no punctures, tears, rips or other defects to the membrane
 - Joining tape: to assess product type, brand, thickness, material, width and colour
 - Lapping design: to assess whether joints are lapped and sealed in accordance with the manufacturers specifications (including double taping and correct overlapping)
 - Laps and sealed joints: to assess double sided tape has been used and welds are undertaken correctly
 - Service entries (where applicable): to assess whether service entries have been appropriately sealed
 - Top hat arrangements (where applicable): with the use of Jubilee clips.

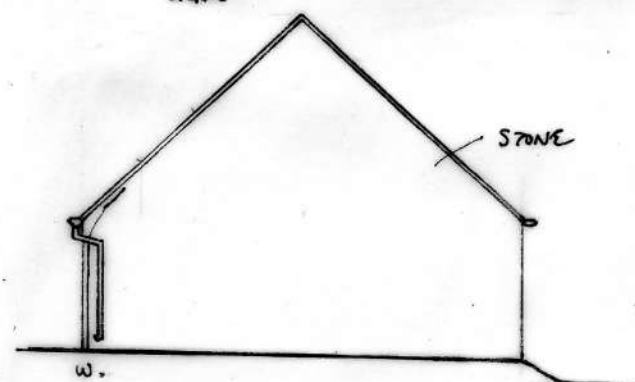
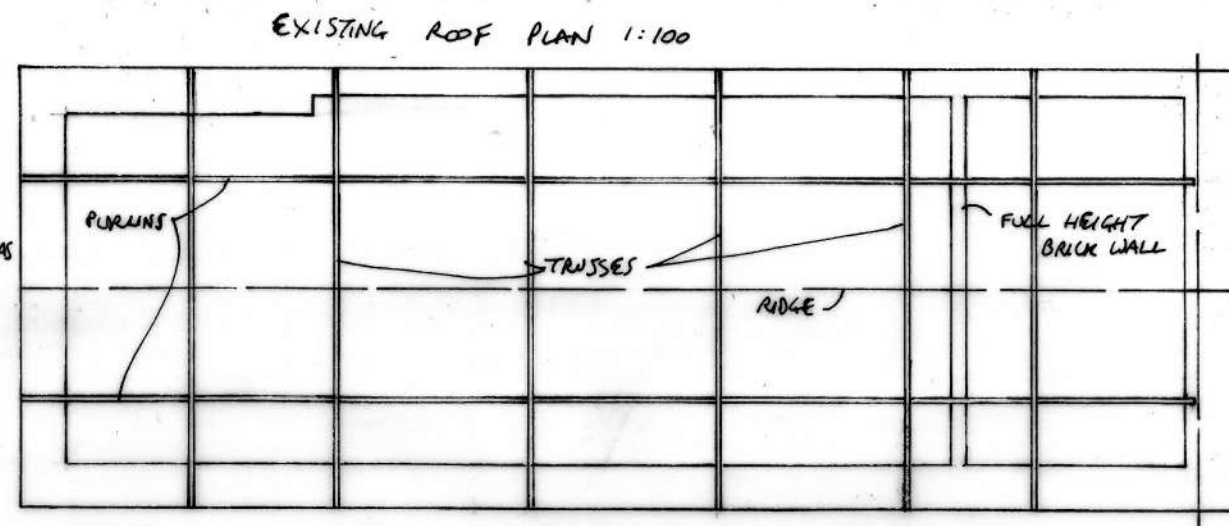
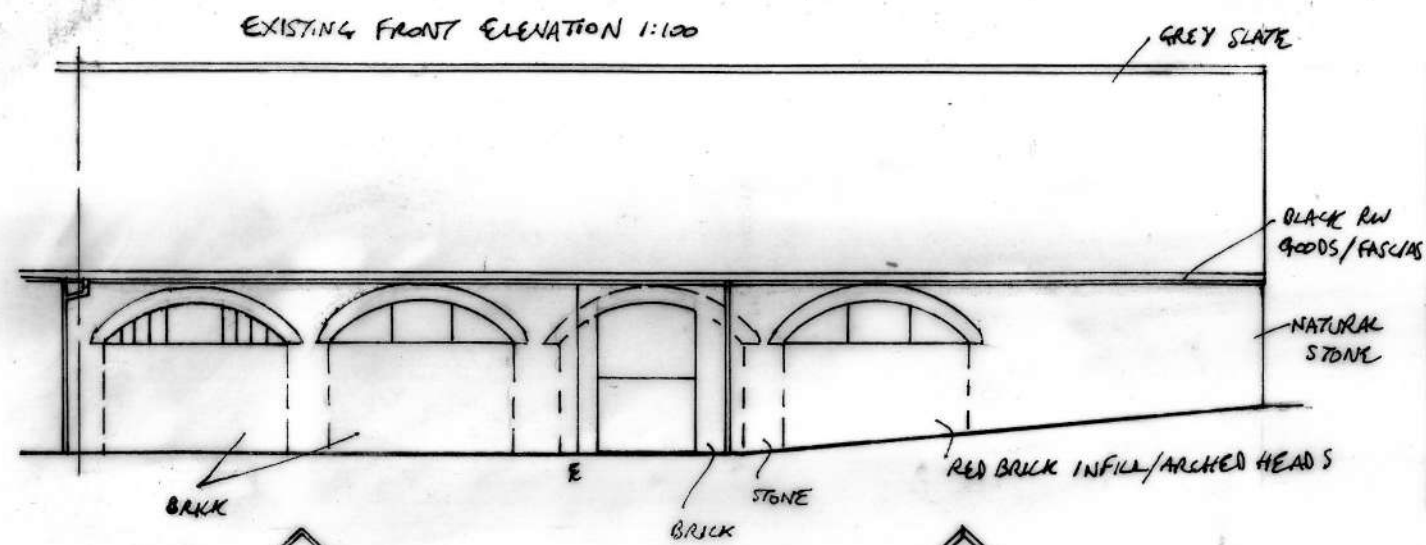
Verification Reporting

The inspection and verification report will be conducted in line with the technical guidance provided in Appendix 4 (which compliments CIRIA C735). The completed inspection record sheets (including a photographic record) will be submitted to the regulatory authorities within validation completion letter report.

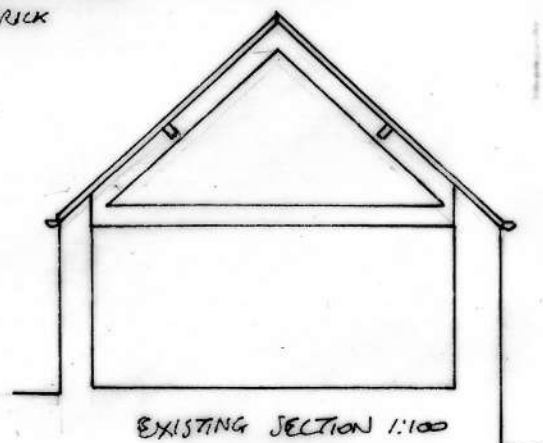
APPENDIX 1



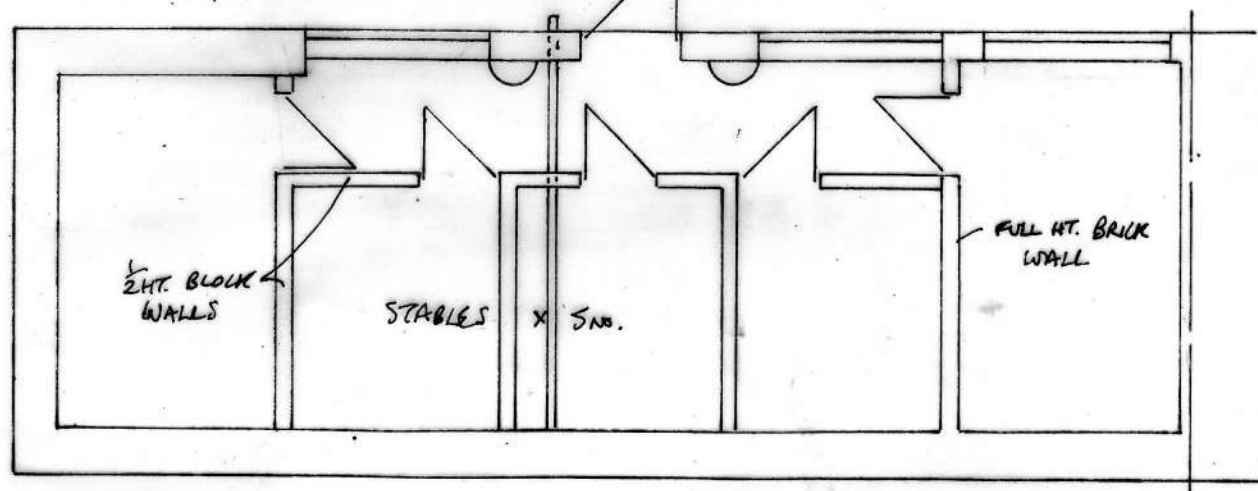
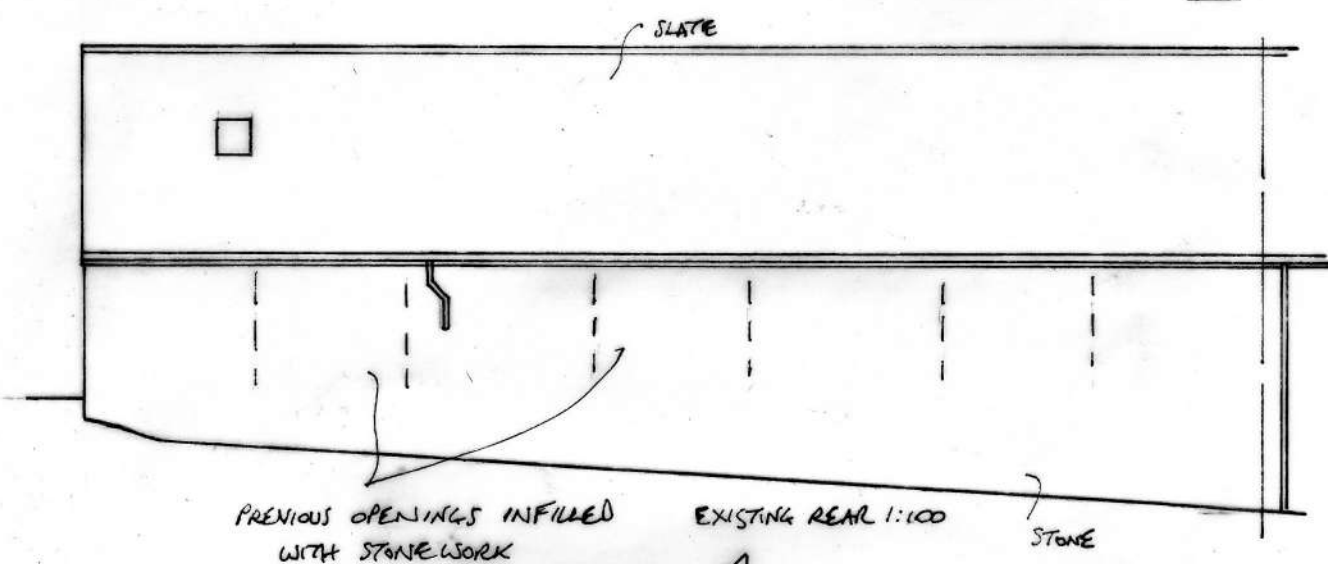
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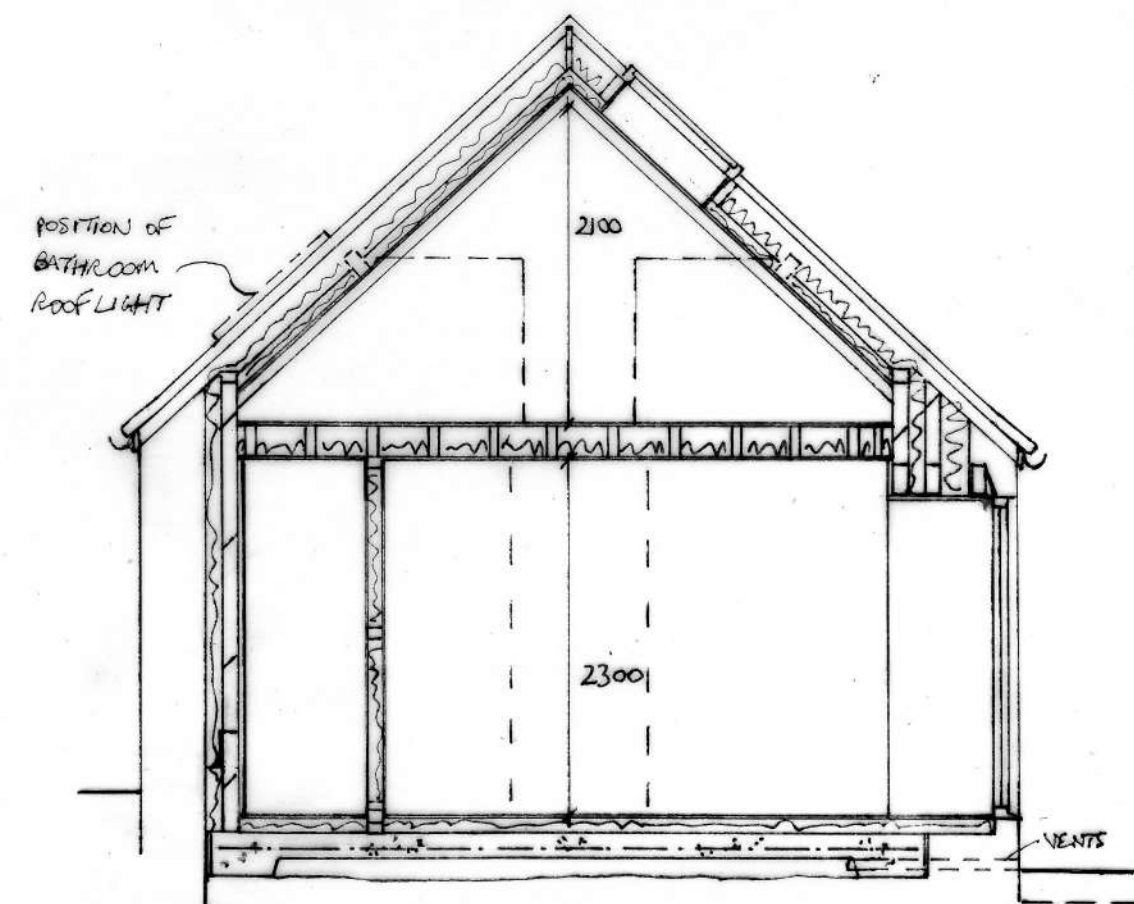
EXISTING SIDE 1:100



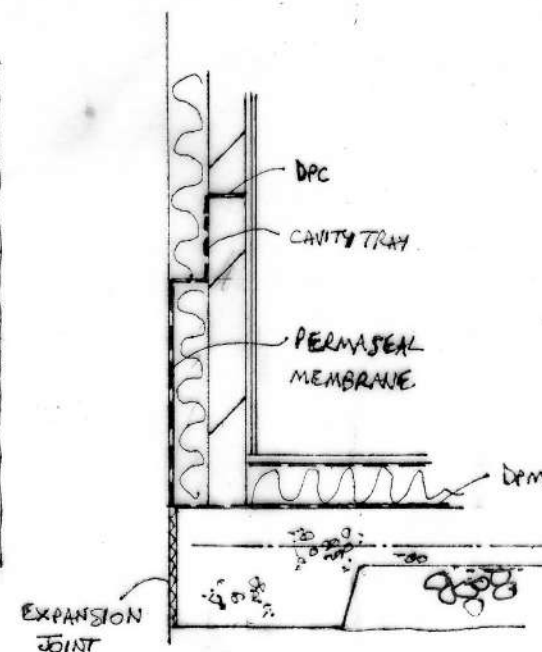
PROPOSED STABLE CONVERSION TO NORTH LIZARD RIDING SCHOOL,
LIZARD LANE, S. SHIELDS FOR MR. NUNN DRG NO 0771/0803/918



EXISTING PLAN 1:100



SECTION 1:50



DPM DETAIL 1:50

APPENDIX 2



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Site Name:		Gas Characteristic Situation:	
Job Number:		Type of Development:	
Date:		Building Description:	
Visit by:		Foundation Type:	
Weather Conditions:		Gas Protection Type:	
Gas Membrane:			
Condition of sub-grade and underside of gas membrane			
Gas membrane type			
Gas membrane condition			
Joining tape product			
Lapping design			
Laps, welds & joints seals			
Service entries seals			
Passive Venting:			
Sub-floor void			
External wall airbricks			
Internal sleeper walls			
External vent trenches/ducts			
Active Venting:			
System details			
Site Notes:			
Signed:		Dated:	

APPENDIX 3



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Visqueen Gas Barrier

Features and benefits

- BBA certified - third party accreditation
- Complies with BS 8485:2015 + A1:2019 - industry standard for methane and carbon dioxide protection
- Flexible - easy to detail and install on site
- Multi functional - also acts as a radon and damp proof membrane
- Dual jointing methods - lap joints can be taped or heat welded

Product description

Visqueen Gas Barrier is a multi-layer reinforced polyethylene gas barrier with a 20 micron aluminium foil. The barrier is coloured blue on the upper surface and silver on the reverse. The product is supplied in single wound rolls (not folded), 2m x 50m.

Approvals and standards

- Third party accreditation (BBA 13/5069)
- Conforms to the specification requirements of BS 8485:2015 + A1:2019
- Suitable for all Characteristic Gas Situation (CS) ground gas regimes
- Conforms to the specification requirements of NHBC Amber 1 and Amber 2 applications
- Conforms to the specification requirements of BR 211:2015
- CE Mark EN 13967:2017
- Quality Management System ISO 9001:2015
- Occupational Health and Safety System ISO 18001:2007
- Environmental Management System ISO 14001:2015

Usage

Visqueen Gas Barrier is suitable for use in all types of buildings to prevent the ingress of harmful levels of ground gases e.g.methane, carbon dioxide and radon.

The barrier can be positioned above or below a solid concrete ground floor slab or above a precast suspended segmental ground floor system, e.g. beam and block floor.

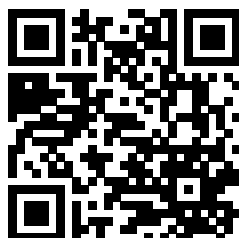
The barrier can also be used as a high performance radon membrane and/or damp proof membrane.

The product is not intended for use where there is a risk of hydrostatic pressure.

System components

- VisqueenPro Double Sided Jointing Tape, 50mm x 10m
- Visqueen Gas Resistant Foil Lap Tape, 75mm x 50m
- Visqueen Ultimate GR Lap Tape, 150mm x 10m
- Visqueen Ultimate Top Hat Units
- Visqueen Preformed Units
- VisqueenPro Detailing Strip, 300mm x 10m, 500mm x 10m
- Visqueen TreadGUARD 300, 2m x 75m
- Visqueen TreadGUARD 1500, 1m x 2m

Find your local stockist





Visqueen Gas Barrier

Storage and handling

Visqueen Gas Barrier should be stored horizontally, under cover in its original packaging.

Care should be taken when handling the product in line with current manual handling regulations.

Preparation

Visqueen Gas Barrier should be installed on a smooth continuous surface e.g. grouted beam and block floor, a compacted blinding layer e.g. 50mm thick sand blinding, or smooth concrete blinding. The substrate should be free from irregularities such as voids or protrusions.

The barrier can be cut with a sharp retractable safety knife or robust scissors.

Installation

Visqueen Gas Barrier should be loose laid on the substrate with the blue side up so as to avoid sunlight glare.

The barrier should be clean and dry at the time of jointing. It should be overlapped by at least 150mm, bonded with Visqueen Pro Double Sided Jointing Tape and sealed with Visqueen Foil Lap Tape. In demanding site conditions seal lap joints with Visqueen Ultimate GR Lap Tape.

Alternatively lap joints can be heat welded to achieve an effective seal. Welded lap joints can be less than 150mm provided the joint integrity is not compromised.

Airtight seals should be formed around all service entry points. Visqueen Preformed Top Hat Units should be used for sealing service entry pipes. The base of the top hat and the upstand should be bonded using Visqueen Pro Double Sided Jointing Tape and sealed with Visqueen Foil Lap Tape. The upstand should be secured with the supplied jubilee clip.

Forming an effective barrier to gases may give rise to complex three-dimensional detailing where, it is recommended Visqueen Preformed Units are used e.g. corners. Alternatively Visqueen Pro Detailing Strip can be used to seal awkward junctions.

If the barrier is punctured or perforated a patch of the same material should be lapped at least 150mm beyond the limits of the puncture and bonded with Visqueen Pro Double Sided Jointing Tape and sealed with Visqueen Foil Lap Tape. Alternatively a patch can be formed using Visqueen Pro Detailing Strip and lapped at least 150mm beyond the extents of the puncture.

The barrier should be covered by a protective layer as soon as possible after installation to prevent damage e.g. from following trades. Care should be taken to ensure that the membrane is not punctured, stretched or displaced when applying a screed or final floor covering. A minimum thickness of 50mm screed is recommended. When reinforced concrete is to be laid over the barrier the wire reinforcements and spacers must be prevented from puncturing the barrier. Where there is a high risk of potential damage, the barrier should be covered with Visqueen TreadGuard protection, screed, or other approved protection material before positioning the reinforcement.

Usable temperature range

It is recommended that Visqueen Gas Barrier and all associated system components should not be installed below 5°C.

Additional information

When used in accordance BS8485:2015 + A1:2019 a subfloor ventilation system or pressure relief maybe required
Where hydrocarbon or VOC contamination is present use Visqueen Ultimate VOC or HC Blok gas protection systems
To assist build sequencing, Visqueen GR DPC is available for gas protection through the wall constructions
For suspended beam and block floor detailing see GB-01
Visqueen Preformed Top Hat Units should be used at service pipe penetrations see GB-51
For internal and external corners Visqueen Ultimate Preformed Units should be used see PFU-553
To seal around steel columns use Visqueen Pro Detailing Strip see GB-52
For additional detailing information, contact Visqueen Technical Services +44 (0) 333 202 6800

Visqueen Gas Barrier

Property	Test method	Units	Compliance criteria	Result
Dimensions	EN 1848-2	m		2 x 50
Overall thickness including scrim mesh	EN 1849-2	mm		0.66
Effective thickness in between scrim mesh	EN 9863-1	mm		0.4
Mass	EN 1849-2	g/m ²	-0%/+5%	400
Tensile strength - MD	EN 12311	N	MDV	391
Tensile strength - CD	EN 12311	N/mm ²	MDV	588
Tensile elongation - MD	EN 12311	%	MDV	20
Tensile elongation - CD	EN 12311	%	MDV	21
Joint strength	EN 12317-2	N	MLV	332
Watertightness 2kPa	EN 1928	-	Pass/Fail	Pass
Resistance to impact	EN 12691	mm	MLV	200
Dart impact	BS 2782	g	MDV	731
Low temperature flexibility	EN 495-5	°C	MDV	-40
Durability against ageing	EN 1296 and EN 1928	-	Pass/Fail	Pass
Durability chemical resistance	EN 1847	-	Pass/Fail	Pass
Resistance to tearing (nail shank) CD	EN 12310-1	N	MDV	358
Resistance to tearing (nail shank) MD	EN 12310-1	N	MDV	368
Resistance to static loading	EN 12730	kg	MLV	20
Water vapour transmission - resistance	EN 1931	MNs/g	MDV	7000
Water vapour transmission - permeability	EN 1931	g/m ² /d	MDV	0.03
Visible defects	EN 1850 -2	-	Pass/Fail	Pass
Reaction to fire	EN 13501-1	Class	MDV	F
BS 8485:2015 + A1:2019 testing requirements				
Mass	EN 1849-2	g/m ²	Average >370	400
Methane permeability	ISO 15105-1	mls/m ² /d/atm	Pass/Fail	<0.15
Puncture CBR	BS EN ISO 12236	N	MDV	1114
Impact resistance	EN 12691	mm	MDV	1000
Tensiles yield strength MD	ASTM D4885-01	kN/m	MDV	12.5
Tensiles yield strength CD	ASTM D4885-02	kN/m	MDV	7.3
Resistance to static loading	EN 12730	kg	>MLV	20
Yield elongation CD	ASTM D4885-04	%	MDV	19
Tear resistance - trouser method A - MD	BS ISO 34-1	kN/m	MDV	48.2
Tear resistance - trouser method A - CD	BS ISO 34-1	kN/m	MDV	44.8
Tear resistance - angle method B - MD	BS ISO 34-1	N	MDV	53.5
Tear resistance - angle method B - CD	BS ISO 34-1	N	MDV	60.6

Health and safety information

Refer to the Visqueen Gas Barrier material safety datasheet (MSDS).

Visqueen Gas Barrier

About Visqueen

The Visqueen name has long been recognised as one of the leading manufacturers of high quality advanced membrane technologies and design based solutions by specifiers, distributors, builders merchants and contractors throughout the UK and Europe.

For further guidance on the Visqueen services shown below, please refer to the relevant section of the Visqueen website (www.visqueen.com) or contact Visqueen Technical Services on +44 (0) 333 202 6800 or enquiries@visqueen.com

Complete Range, Complete Solution



Structural
Waterproofing



Gas
Protection



Damp Proof
Membrane



Tapes



Damp Proof
Course



Stormwater



Vapour
Control

Visqueen Technical Support

Visqueen combine an extensive product portfolio with industry leading levels of service and support which includes guidance over the phone, bespoke CAD drawings to help with complex detailing, electronic NBS specifications and access to a dedicated team of highly knowledgeable and experienced field based Technical Support Managers.

Visqueen Technical Support is available to all our customers including architects, specifiers, distributors, builders merchants, contractors and end users. All of our technical team have been awarded the industry recognised qualification Certificated Surveyor in Structural Waterproofing (CSSW).

Visqueen CPD Seminars

The Visqueen Continuing Professional Development (CPD) Seminars provide up-to-date information on changes within Building Regulations/Building Standards and nationally recognised industry guidance affecting damp proofing, water vapour control, hazardous ground gas protection and below ground structural waterproofing.

The one hour seminars have been produced for design specialists within the construction sector and are delivered by our team of Technical Support Managers.

Visqueen PI designs and special projects

From initial design to the completed project, Visqueen are with you every step of the way. Whether it be hazardous ground gas protection and/or below ground waterproofing protection employing barrier, structurally integral or drained systems, Visqueen can offer professional indemnity (PI) insurance for bespoke Visqueen design solutions.

Visqueen Technical Support Managers work with all stakeholders to provide cost effective Visqueen solutions offering complete peace of mind throughout the construction phase and beyond.

Visqueen Training Academy

Based at our manufacturing facility in Derbyshire, the Visqueen Training Academy is available to support Visqueen customers throughout the UK by providing a wide range of both theory and practical skills related training.

Courses include one day product awareness training for our distributors and builders merchants to help them in their day-to-day jobs, through to intensive three day courses giving detailed hands-on training in the practical skills required for safe and robust product installation.



Visqueen Gas Resistant Foil Lap Tape, 75mm x 50m

Features and benefits

- BBA certified jointing system - third party accreditation
- Complies with BS 8485:2015 + A1:2019 - industry standard for methane and carbon dioxide protection
- Good adhesion properties - provides an overlap seal to Visqueen gas protection membranes
- Joint integrity - stops poured concrete entering the lap joint
- Health and Safety - seals the exposed lap from risk of installer accidents

Product description

Visqueen Gas Resistant (GR) Foil Lap Tape is an overlap tape which has a solvent acrylic adhesive with a composite aluminium/PET carrier therefore it is resistant to alkaline which is present in cement and concrete. The tape also has a release film.

The product is supplied in roll format 75mm x 50m.

To be used in conjunction with Visqueen Pro Double Sided Jointing Tape 50mm x 10m.

Approvals and standards

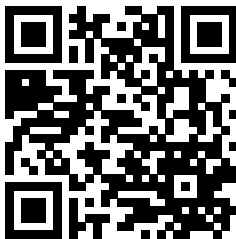
- Third party accreditation (BBA 13/5069)
- Conforms to the specification requirements of BS 8485:2015 + A1:2019
- Quality Management System ISO 9001:2015
- Occupational Health and Safety System ISO 18001:2007
- Environmental Management System ISO 14001:2015

Usage

Visqueen Gas Resistant Foil Lap Tape is used to bond lap joints on gas protection membranes. It can be used internally and externally and is suitable in compressed load applications.

System components

Find your local stockist



Visqueen Gas Resistant Foil Lap Tape, 75mm x 50m

Storage and handling

Store in warm, dry and clean environment in its current packaging. The tape should not be exposed to long periods of ultraviolet light. In very cold weather, prior to use ensure that the material is stored in warm conditions above 5°C.

Preparation

Ensure all surfaces are clean and dry. The membrane joint surfaces should be dry and free from contamination such as dust or sand. Ensure the surface and working area is not water logged. Avoid areas of unsupported jointing.

Installation

The membrane should be overlapped by at least 150mm, bonded with Visqueen Pro Double Sided Jointing Tape and sealed with Visqueen Gas Resistant Foil Lap Tape.

When using the GR Foil Lap tape, apply the tape equidistant over the lap area of the laid sheet and the overlap adjoining membrane. Apply pressure to the jointed area to ensure adhesion. Once the tape is applied, the completed lap should be well rolled with firm pressure to ensure a complete seal joint has occurred, and continuity with the adjacent sheet has been achieved.

Usable temperature range

It is recommended that the system components should be used above 5°C.

Additional information

In demanding site conditions seal lap joints with Visqueen Ultimate GR Lap Tape.

Visqueen Gas Resistant Foil Lap Tape, 75mm x 50m

Property	Result
Dimensions	75mm x 50m
Peel adhesion	750N/m
Adhesive type	Solvent acrylic

Health and safety information

Please refer to material safety datasheet.

Visqueen Gas Resistant Foil Lap Tape, 75mm x 50m

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Complete Range, Complete Solution



Structural Waterproofing



Gas Protection



Damp Proof Membrane



Tapes



Damp Proof Course



Stormwater



Vapour Control

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Visqueen Preformed Units

Features and benefits

- Factory manufactured three dimensional shapes - simplifies complex detailing
- Flexible materials - easy to install on site
- Extensive range - suitable for both damp and gas proofing applications
- Versatile - ideal for built-in and surface fixed cavity tray applications
- BBA/BDA certified - third party certifications
- Cost effective - speeds up installation on site
- Multi-functional - compatible with all Visqueen damp and gas proof courses and membranes

Product description

Visqueen Preformed Units (PFUs) are factory manufactured three dimensional shapes. The units are formed from either Visqueen Zedex CPT High Performance DPC (Zedex Units) or Visqueen Ultimate HC Blok (Ultimate Units).

Approvals and standards

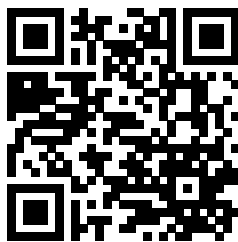
- Third party accreditation (BBA 94/3059) for Zedex Units
- Third party accreditation (BDA BAF-18-051-P-A-UK) for Ultimate Units
- Conforms to the specification requirements of NHBC Amber 1 applications (Zedex Units)
- Conforms to the specification requirements of NHBC Amber 2 applications (Ultimate Units)
- Conforms to the specification requirements of BR 211:2015 (Zedex Units)
- CE Mark EN 14909:2012 (Zedex Units)
- CE Mark EN 13967:2017 (Ultimate Units)
- Quality Management System ISO 9001:2015
- Occupational Health and Safety System ISO 18001:2007
- Environmental Management System ISO 14001:2015

Usage

Visqueen Preformed Units are suitable for detailing complex or awkward junctions in masonry wall applications including residential, commercial and multi storey buildings. The units can also be used for complex junctions associated with membrane applications within floor constructions, e.g. door thresholds and corners etc. The units can also be used to prevent harmful ground gases from entering into the building at the above junctions.

System components

Find your local stockist



Visqueen Preformed Units

Storage and handling

Visqueen Preformed Units should be stored under cover in their original packaging.

Care should be taken when handling the product in line with current manual handling regulations.

Preparation

Where necessary Visqueen Preformed Units should be cut with a sharp retractable safety knife or robust scissors.

Installation

When used for sealing complex junctions in cavity tray applications, Visqueen Preformed Units should be installed prior to the main run of the cavity tray material, and the lap joints bonded with Visqueen Zedex DPC Jointing Tape.

Where the Visqueen Preformed Unit is required to be surface fixed to the inner leaf of a cavity wall construction the vertical portion of the unit should be bonded to the inner leaf with Visqueen Zedex DPC Jointing Tape, the substrate having been previously primed with Visqueen High Performance Tanking Primer and allowed to dry.

Visqueen Zedex DPC Fixing Strip should be used to secure the upper edge of the unit using appropriate Visqueen Fixing Pins (or alternative approved) to provide a permanent mechanical fix.

When used for sealing complex junctions in floor membrane applications, Visqueen Preformed Units should be bonded and sealed with the same taping system as used for the membrane lap joints.

Usable temperature range

It is recommended that Visqueen Preformed Units and all associated system components should not be used below 5°C.

Additional information

Regarding cavity tray applications, for built-in internal and external corners see PFU-553 (90° unit) or PFU-501 (sloping unit)

For surface fixed internal and external corners see PFU-554 (90° unit) or PFU-502 (sloping unit)

For membrane corners see PFU-554 (box unit) or PFU-553 (inner leaf unit)

For door thresholds see PFU-206

For information on other available Visqueen Preformed Units, contact Visqueen Technical Services +44 (0) 333 202 6800

Visqueen Preformed Units

Property	Test method	Units	Compliance criteria	Zedex Units results	Ultimate Units results
Thickness	EN 1849-2	mm	-10%/+10%	0.8	0.5
Grammage (Mass per unit area)	EN 1849-2	g/m ²	-10%/+10%	750	470
Watertightness 2kPa	EN 1928	-	Pass/Fail	Pass	Pass
Resistance to low temperatures	EN 495-5	°C	MDV	-40	-40
Flexibility at temperatures	EN1109	°C	MDV	-15	-15
Flexibility at temperatures	EN 495-5	°C	MDV	-15	-40
Durability (artificial ageing)	EN 1296 and EN 1928	-	Pass/Fail	Pass	Pass
Durability Chemical Resistance	EN 1847	-	Pass/Fail	Pass	Pass
Durability against alkali - Annex C	EN 14909	-	Pass/Fail	Pass	Pass
Water vapour transmission - resistance	EN 1931	MNs/g	MDV	372	1034
Water vapour transmission - permeability	EN 1931	g/m ² /d	MDV	0.4	0.13
Radon permeability	SP Method no. 3873.	m ² /s	MDV	8.30 x 10 ⁻¹²	
Carbon Dioxide Permeability	ISO 2782:1995	m ² /sec/Pa	MDV	1.58 x 10 ⁻¹⁶	
Methane permeability	ISO15105-1	ml/m ² /d/atm	MDV		1.3
Reaction to Fire	EN 13501-1	Class	MDV	F	

Health and safety information

Please refer to material safety datasheet.

Visqueen Preformed Units

About Visqueen

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Complete Range, Complete Solution



Structural
Waterproofing



Gas
Protection



Damp Proof
Membrane



Tapes



Damp Proof
Course



Stormwater



Vapour
Control

Visqueen Technical Support

Visqueen combine an extensive product portfolio with industry leading levels of service and support which includes guidance over the phone, bespoke CAD drawings to help with complex detailing, electronic NBS specifications and access to a dedicated team of highly knowledgeable and experienced field based Technical Support Managers.

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VisqueenPro Detailing Strip, 300mm x 10m, 500mm x 10m

Features and benefits

- Utilises Visqueen's Advanced Adhesion Technology - twice the adhesion in cold weather
- Complete system - use with Visqueen HP Tanking Primer to obtain best performance
- Flexible - can be cut and shaped to various applications
- Multi-use - ideal for complex junctions, stanchions, patchwork and terminations
- Aluminium core - gas resistant in accordance with BS8485:2015+A1:2019

Product description

VisqueenPro Detailing Strip is a composite of PET/aluminium and a high performance cold weather butyl compound. It is available in roll format, 300mm x 10m.

Approvals and standards

- Third party accreditation - BBA certification
- Conforms to the specification requirements of BS 8485:2015 + A1:2019
- Suitable for all Characteristic Gas Situation (CS) ground gas regimes
- Conforms to the specification requirements of NHBC Amber 1 and Amber 2 applications
- Conforms to the specification requirements of BR 211:2015
- Quality Management System ISO 9001:2015
- Occupational Health and Safety System ISO 18001:2007
- Environmental Management System ISO 14001:2015

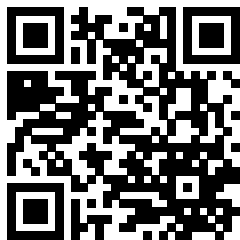
Usage

Visqueen ProDetailing Strip can be used for gas protection systems, waterproofing system, and damp proofing systems for use on concrete, blockwork, brickwork, particle boards, steel work, steel stanchions and wooden structures for both vertical and horizontal application.

VisqueenPro Detailing Strip is post applied against the structure, steel stanchions and forms complex detailing. It forms a 2-part system with the Visqueen HP Tanking Primer. The Visqueen HP Tanking Primer is a single component primer, for use see separate datasheet.

System components

Find your local stockist





VisqueenPro Detailing Strip, 300mm x 10m, 500mm x 10m

Storage and handling

Store in warm (above 5°C), dry and clean environment in its current packaging. The product must be stored upright.

Preparation

Surfaces must be smooth and free from sharp protrusions, ensure the surface and working area is not water logged and is frost free. When applying to blockwork or brickwork the joints must be flush pointed, in demanding applications the masonry face must be rendered prior to applying the Visqueen Pro Detailing Strip. Prior to applications the surface should be sealed using Visqueen HP Tanking Primer and allowed to dry thoroughly. The Visqueen HP Tanking Primer must not be used on Insulation or ICF systems, please contact Visqueen Technical Department.

Installation

All lap joints should be a minimum of 150mm and must be pressed and rolled to form a continuous bond to ensure gas and water tightness.

For complex detailing the detailing strip can easily be cut, shaped and formed around the area.

For patch work - when membranes are punctured, VisqueenPro Detailing Strip can be lapped at least 150mm beyond the extents of the puncture.

Usable temperature range

It is recommended that Visqueen membranes and system components should be used above 5°C

Additional information

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VisqueenPro Detailing Strip, 300mm x 10m, 500mm x 10m

Property	Value
Width	300mm
Length	10m
Application temperature range	-5°C to 40°C
Peel Adhesion EN12316; Steel ASTM D1000 @ 5oC	N/cm
Polyethylene	20.7
PE with no static charge	21.2
Steel	26.9
Concrete	28.8

Health and safety information

Please refer to material safety datasheet

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Gas Protection



Damp Proof Membrane



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VisqueenPro Double Sided Jointing Tape, 50mm x 10m

Features and benefits

- Third party certification - part of a dpm/ gas protection BBA approved jointing system
- Gas resistant - provides excellent resistance to harmful bulk gases ingress and moisture ingress
- Excellent adhesion - to gas and damp proof membranes

Product description

VisqueenPro Double Sided Jointing Tape is a double sided butyl based compound with an oversize quick release film. It is available in roll format 50mm x 10m.

To complete the joint use the Visqueen Gas Resistant Foil Tape for gas applications and use the Visqueen Pro Single Sided Tape for damp applications.

Approvals and standards

- Third party accreditation - BBA certification
- Conforms to the specification requirements of BS 8485:2015 + A1:2019
- Quality Management System ISO 9001:2015
- Occupational Health and Safety System ISO 18001:2007
- Environmental Management System ISO 14001:2015

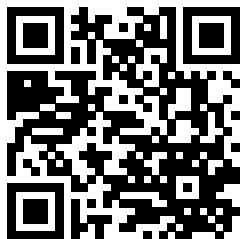
Usage

VisqueenPro Double Sided Jointing Tape is used to bond membranes (gas or damp) together along the appropriate sheet lap ends. It can also be used for patch work where the membrane is punctured, creating airtight seals around pipe penetrations and bonding the floor membrane to the damp proof course at the horizontal plane.

To complete the joint use the Visqueen Gas Resistant Foil Tape for gas applications or use the Visqueen Pro Single Sided Tape for damp proof membranes.

System components

Find your local stockist





VisqueenPro Double Sided Jointing Tape, 50mm x 10m

Storage and handling

Store in warm, dry and clean environment in its current packaging. The tape should not be exposed to long periods of ultraviolet light. In very cold weather, prior to use ensure that the material is stored in warm conditions above 5°C.

Preparation

Ensure all surfaces are clean and dry. The membrane joint surfaces should be dry and free from contamination such as dust or sand. Ensure the surface and working area is not water logged. Avoid areas of unsupported jointing.

Installation

Apply VisqueenPro Double Sided Jointing Tape to the lap area of the laid sheet starting approximately 50mm from the membrane edge. Apply pressure to the tape to ensure the tape has adhered to the membrane. Remove quick release paper from the tape and overlap the adjoining membrane by minimum 150mm. For Visqueen damp proof membranes and gas protection membranes lap joints should then be sealed using the appropriate Visqueen lap tape. Once the tape is applied, the completed lap should be well rolled with firm pressure to ensure a complete seal joint has occurred, and continuity with the adjacent sheet has been achieved.

If the membrane is punctured or perforated a patch of the same material should be lapped at least 150mm beyond the limits of the puncture and bonded with VisqueenPro Double Sided Jointing Tape and sealed with the appropriate lap tape.

Airtight seals should be formed around all service entry points. Visqueen Preformed Top Hat Units should be used for sealing service entry pipes. The base of the top hat and the upstand should be bonded using Visqueen Pro Double Sided Jointing Tape and sealed with Visqueen Foil Lap Tape. The upstand should be secured with the supplied jubilee clip.

Usable temperature range

It is recommended that VisqueenPro Double Sided Jointing Tape and other system components should be used above 5°C.

Additional information



VisqueenPro Double Sided Jointing Tape, 50mm x 10m

Property	Result
Width	50mm
Length	10m
Colour	Blue
Adhesive type	Butyl
Dynamic Shear Adhesion	14 N/cm ²
Dynamic Tensile Adhesion	18 N/cm ²
180° Peel Adhesion	11 N/cm ²
Moisture Vapour Transmission Rate	0.24 g/m ² /d
Service Temperature Range	-40 to 90°C
Application temperature	>5°C

Health and safety information

Please refer to material safety datasheet.

VisqueenPro Double Sided Jointing Tape, 50mm x 10m

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Visqueen TreadGUARD 300, 2m x 75m

Features and benefits

- Good impact strength - Protects construction membranes from damage in light duty applications
- Woven structure - protection against rebars and following trades
- Large roll format - covers large areas fast

Product description

The Visqueen TreadGUARD 300 is a light duty PP non woven needle punched geotextile.

The product is supplied in 2m x 75m roll format.

Approvals and standards

- CE Mark EN14909
- Quality Management System ISO 9001

Usage

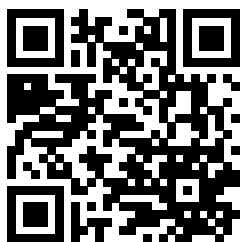
The Visqueen TreadGUARD 300 is used to protect construction membranes in light duty applications.

It is suitable in horizontal applications for the protection of dpm and gas membranes from rebars and following trades.

In heavy duty applications please use Visqueen TreadGUARD 1500.

System components

Find your local stockist





Visqueen TreadGUARD 300, 2m x 75m

Storage and handling

Store in a dry and clean environment in its current packaging. The Visqueen TreadGUARD 300 should not be exposed to long periods of ultraviolet light.

The product weighs 35kg therefore care should be taken when handling.

Preparation

Ensure the surface and working areas are not water logged and free from sharp protrusions.

Installation

Apply the TreadGUARD 300 by unrolling across the laid construction membrane and overlap by a minimum 100mm.

In windy weather conditions use the Visqueen Pro Double Sided Jointing tape to secure the TreadGUARD 300 and use bricks at perimeter edges to hold firmly in position.

Once applied the concrete floor slab or back fill must be poured over the exposed TreadGUARD 300 within 30 days.

Usable temperature range

The system is recommended to be used above 5°C.

Additional information

Care must be taken when lifting this product as the product is bulky and heavy, it weighs 35kg.



Visqueen TreadGUARD 300, 2m x 75m

Property	Value
Dimensions	2m x 75m
CBR Static Puncture	2000N
Tensile Strength MD	10 kN/m
Tensile Strength TD	10 kN/m
Elongation at break- MD	80%
Elongation at break- TD	80%

Health and safety information

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Visqueen TreadGUARD 1500, 1m x 2m

Features and benefits

- High impact strength - Protects construction membranes from damage in heavy duty applications
- Embossed - anti-slip surface
- Heavy duty - protection against rebars, wind uplift and following trades

Product description

The Visqueen TreadGUARD 1500 is a heavy duty HDPE ridged plastic protection board with an embossed upper surface.

The board is 1m x 2m printed Visqueen TreadGUARD1500 for ease of identification.

Approvals and standards

- Third party accreditation - BBA certified as a system component.
- Quality Management System ISO 9001:2015
- Occupational Health and Safety System ISO 18001:2007
- Environmental Management System ISO 14001:2015

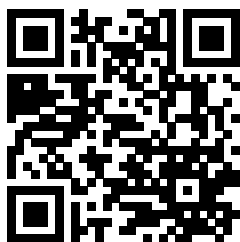
Usage

The Visqueen TreadGUARD 1500 is used to protect construction membranes in heavy duty applications.

It is suitable in horizontal applications for the protection of dpm and gas membranes from rebars and following trades.

System components

Find your local stockist





Visqueen TreadGUARD 1500, 1m x 2m

Storage and handling

Store in a dry and clean environment in its current packaging. The Visqueen TreadGUARD 1500 should not be exposed to long periods of ultraviolet light.

Preparation

Ensure the surface and working areas are not water logged and free from sharp protrusions.

Installation

Apply the TreadGUARD 1500 boards above the laid construction membrane and butt joint together. Joints can be taped with VisqueenPro Single Sided Jointing Tape applied equidistant over the junction. Apply pressure to the tape to ensure adhesion.

Usable temperature range

The system is recommended to be used between above 5°C.

Additional information

Ensure the membrane is free from sharp protrusions prior to using the board.



Visqueen TreadGUARD 1500, 1m x 2m

Property	Value
Dimesions	2m x 1m
Impact resistance BS EN 12691 (A)	>1000mm

Health and safety information

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Visqueen Ultimate GR Lap Tape, 150mm x 10m

Features and benefits

- Third party certification - part of a gas protection BDA approved jointing system
- Gas resistant - provides excellent resistance to harmful bulk gases ingress and moisture ingress
- Excellent adhesion - to gas membranes
- Extra wide - to improve joint strength and prevent gas ingress
- Joint integrity - stops poured concrete entering the lap joint
- Health and Safety - seals the exposed lap from risk of installer accidents

Product description

Visqueen Ultimate Gas Resistant (GR) Lap Tape is an aluminium/HDPE composite with a thick bitumen adhesive layer. The tape has a release film.

The tape is available in roll format 150mm x 10m

Approvals and standards

- Third party accreditation - BDA certification
- Conforms to the specification requirements of BS 8485:2015 + A1:2019
- Quality Management System ISO 9001:2015
- Occupational Health and Safety System ISO 18001:2007
- Environmental Management System ISO 14001:2015

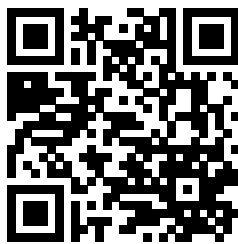
Usage

Visqueen Ultimate Gas Resistant Lap Tape is used to seal lap overlap joints on Visqueen Ultimate gas protection membranes. It can be used internally and externally and is suitable in compressed load applications.

It can also be used for patch work where the membrane is punctured, creating airtight seals around pipe penetrations and sealing the floor membrane to the damp proof course at the horizontal plane at the overlap.

System components

Find your local stockist



Visqueen Ultimate GR Lap Tape, 150mm x 10m

Storage and handling

Store in warm, dry and clean environment in its current packaging. The tape should not be exposed to long periods of ultraviolet light. In very cold weather, prior to use ensure that the material is stored in warm conditions above 5°C.

Preparation

Ensure all surfaces are clean and dry. The membrane joint surfaces should be dry and free from contamination such as dust or sand. Ensure the surface and working area is not water logged. Avoid areas of unsupported jointing. The tape can be cut with a sharp knife.

Installation

Apply the tape equidistant over the lap area of the laid sheet and the adjoining membrane. Apply pressure to the jointed area to ensure adhesion. Once the tape is applied, the completed lap should be well rolled with firm pressure to ensure complete adhesion and continuity.

Usable temperature range

It is recommended that Visqueen Ultimate Gas Resistant Lap Tape and other system components should be used above 5°C.

Additional information

Avoid areas of unsupported jointing.

Visqueen Ultimate GR Lap Tape, 150mm x 10m

Property	Value
Dimensions	150mm x 10m
Adhesive colour	Black
Application temperature	5°C to 40°C
Service temperature	-40°C to 80°C

Health and safety information

Please refer to material safety datasheet.

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Visqueen Ultimate Top Hat Units

Features and benefits

- Proven solution - provides a gas tight seal around service pipe entries
- Flexible - quick and easy to fit
- Ideal for drainage and service pipes

Product description

Visqueen Ultimate Top Hat Units are made from polyethylene consisting of a gas barrier core.

Available in standard sizes such as 110mm and 160mm. Can be made to a size that suits individual project requirements.

The units are supplied with metal jubilee clips.

Approvals and standards

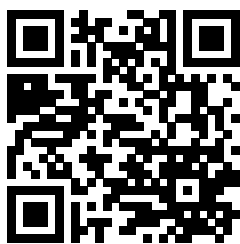
- Third party certification - BDA certified with Visqueen Ultimate and gas membranes
- Quality Management System ISO 9001:2015
- Occupational Health and Safety System ISO 18001:2007
- Environmental Management System ISO 14001:2015

Usage

The Visqueen Ultimate Top Hat Unit is suitable for all applications where a gas, VOC and damp proof seals are required to drainage and service pipes.

System components

Find your local stockist





Visqueen Ultimate Top Hat Units

Storage and handling

Store the Visqueen Ultimate Top Hats in warm, dry and clean environment in its current packaging. The units should not be exposed to long periods of ultraviolet light. In very cold weather, prior to use ensure that the material is stored in warm conditions above 5°C.

Preparation

Ensure all surfaces are clean, dry and free from contamination such as dust or sand. Ensure the surface and working area is not water logged. Avoid areas of unsupported jointing.

Installation

Cut a circular hole in the membrane as close as possible to the pipe, or pipe socket. Ensure that pipe penetrations do not occur at joints in the membrane. With the pipe in position, slide the Visqueen Ultimate Top Hat Unit over the pipe. Mark the extent of the square horizontal skirt over the membrane and also mark the line of the top of the Visqueen Ultimate Top Hat Unit around the pipe. Raise the Visqueen Ultimate Top Hat unit and cut four lengths of Visqueen Ultimate Double Sided Tape, one for each side of the horizontal skirt, allowing for an overlap at each corner. Release the quick release paper from each of the four lengths of double-sided tape. Lower the Visqueen Ultimate Top Hat Unit, ensuring that the free end of the release paper around the pipe is reachable, and seal the horizontal skirt to the membrane. Seal the junction of the horizontal skirt and the membrane with Visqueen Lap Tape. Seal around the collar of the Visqueen Ultimate Top Hat Unit with Visqueen Lap Tape ensuring that the tape seals around the collar and pipe to create an airtight seal. Complete the install with a jubilee clip around the collar of the pipe.

Usable temperature range

It is recommended that Visqueen Ultimate Top Hat and other system components should be used above 5°C.

Additional information

In some applications the Visqueen Ultimate Top Hat units can be site welded to the membrane.

Visqueen Ultimate Top Hat Units

Property	Test method	Units	Criteria	Result	
Colour				Gold/White	
Weight		kilos		49	
Drimensions		mm		110, 160*	
* bespoke sizes avaialable on request			-0/+10%		
BS8485:2015 - Methane testing	Test method	Units	Criteria	Result	
Methane permeability	ISO 15105-1	ml/m ² /d/atm	<40	1.3	
C748 - Permeation vapour tests - 100% concentration		Criteria	ml/m ² /d	mg/m ² /d	mg/m2/hr
benzene	ISO 15105-2	MDV	0.08	70	2.92
toluene	ISO 15105-2	MDV	0.09	78.5	3.27
ethyl benzene	ISO 15105-2	MDV	0.11	93.8	3.91
m,p xylene	ISO 15105-2	MDV	0.01	6.7	0.28
hexane	ISO 15105-2	MDV	gas	2.6	0.11
vinyl chloride	ISO 15105-2	MDV	0	6.4	0.27
tetrachloroethene (PCE)	ISO 15105-2	MDV	0	3.2	0.13
trichloroethene (TCE)	ISO 15105-2	MDV	solid	0.3	0.01
naphthalene	ISO 15105-2	MDV	0.03	19.7	0.82
C748 - Chemical immersion testing		weight %	Thickness %	Tensiles/elongation	
Pass is achieved if the aged membrane is within 25% of the fresh sample					
Benzene	EN14414	Pass	Pass	Pass	
Toluene	EN14414	Pass	Pass	Pass	
Ethyl benzene	EN14414	Pass	Pass	Pass	
(m,p, and o) xylenes	EN14414	Pass	Pass	Pass	
Hexane	EN14414	Pass	Pass	Pass	
Vinyl chloride	EN14414	Pass	Pass	Pass	
Tetrachlorororthene	EN14414	Pass	Pass	Pass	
Trichloroethene	EN14414	Pass	Pass	Pass	
Naphthalene	EN14414	Pass	Pass	Pass	

Health and safety information

Please refer to material safety datasheet.

Visqueen Ultimate Top Hat Units

About Visqueen

The Visqueen name has long been recognised as one of the leading manufacturers of high quality advanced membrane technologies and design based solutions by specifiers, distributors, builders merchants and contractors throughout the UK and Europe.

For further guidance on the Visqueen services shown below, please refer to the relevant section of the Visqueen website (www.visqueen.com) or contact Visqueen Technical Services on +44 (0) 333 202 6800 or enquiries@visqueen.com

Complete Range, Complete Solution



Structural
Waterproofing



Gas
Protection



Damp Proof
Membrane



Tapes



Damp Proof
Course



Stormwater



Vapour
Control

Visqueen Technical Support

Visqueen combine an extensive product portfolio with industry leading levels of service and support which includes guidance over the phone, bespoke CAD drawings to help with complex detailing, electronic NBS specifications and access to a dedicated team of highly knowledgeable and experienced field based Technical Support Managers.

Visqueen Technical Support is available to all our customers including architects, specifiers, distributors, builders merchants, contractors and end users. All of our technical team have been awarded the industry recognised qualification Certificated Surveyor in Structural Waterproofing (CSSW).

Visqueen CPD Seminars

The Visqueen Continuing Professional Development (CPD) Seminars provide up-to-date information on changes within Building Regulations/Building Standards and nationally recognised industry guidance affecting damp proofing, water vapour control, hazardous ground gas protection and below ground structural waterproofing.

The one hour seminars have been produced for design specialists within the construction sector and are delivered by our team of Technical Support Managers.

Visqueen PI designs and special projects

From initial design to the completed project, Visqueen are with you every step of the way. Whether it be hazardous ground gas protection and/or below ground waterproofing protection employing barrier, structurally integral or drained systems, Visqueen can offer professional indemnity (PI) insurance for bespoke Visqueen design solutions.

Visqueen Technical Support Managers work with all stakeholders to provide cost effective Visqueen solutions offering complete peace of mind throughout the construction phase and beyond.

Visqueen Training Academy

Based at our manufacturing facility in Derbyshire, the Visqueen Training Academy is available to support Visqueen customers throughout the UK by providing a wide range of both theory and practical skills related training.

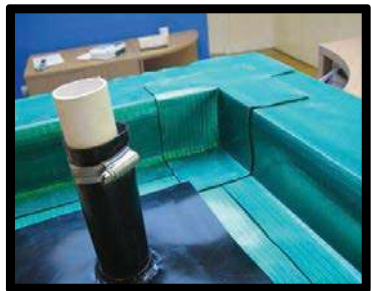
Courses include one day product awareness training for our distributors and builders merchants to help them in their day-to-day jobs, through to intensive three day courses giving detailed hands-on training in the practical skills required for safe and robust product installation.



APPENDIX 4



SPIRE
GEOTECHNICAL
Geologists & Site Investigation Specialists



VERIFICATION REQUIREMENTS FOR GAS PROTECTION SYSTEMS

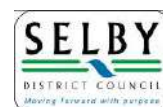
Technical Guidance for
Developers,
Landowners and
Consultants



Yorkshire and Lincolnshire
Pollution Advisory Group

Version 1.1 – December 2016

The purpose of this guidance is to promote consistency and good practice for development on land affected by contamination. The Local Planning Authorities in Yorkshire, Lincolnshire and the North East of England who have adopted this guidance are shown below:



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Disclaimer

This guidance is intended to serve as an informative and helpful source of advice. It is intended to review this guidance annually, but readers must note that legislation, guidance and practical methods are inevitably subject to change and therefore should be aware of current UK policy and best practice. This note should be read in conjunction with prevailing legislation and guidance, as amended, whether mentioned here or not. Where legislation and documents are summarised this is for general advice and convenience, and must not be relied upon as a comprehensive or authoritative interpretation. Ultimately it is the responsibility of the person/company involved in the verification of land contamination to apply up-to-date working practices and requirements.

Acknowledgments

The authors and YALPAG would like to specifically acknowledge and thank CIRIA for the permission to use sections, including tables and photographs, of the CIRIA C735 document. Mallett, H, Cox (nee Taffel-Andureau), L, Wilson, S, Corban, M (2014) *Good practice on the testing and verification of protection systems for buildings against hazardous ground gases*, CIRIA, C735, London (ISBN: 978-0-86017-739-5). Go to: www.ciria.org

The author, Leeds City Council (Brad Hall, Julia Reynolds), would like to acknowledge the assistance provided by the following people and organisations: East Riding of Yorkshire Council, Doncaster Metropolitan Borough Council, Wakefield Council, Hugh Mallett of BuroHappold, Neil Salvage of PAGEotechnical and John Naylor of Ground-Gas Solutions.

Consultation

The YALPAG Local Planning Authorities were consulted over a four week period in 2015 during the production of this guidance. Consultation comments were considered by the review panel and a number of revisions were made to the guidance to reflect these comments.

Introduction

This guidance has been produced to help developers ensure that they can demonstrate that gas protection systems are appropriate for the development and level of risk associated with a site and that they have been installed correctly and can be relied upon to provide the required level of protection and ultimately demonstrate that, in terms of gas risk, the development is suitable for use. It is intended to improve the quality of reports submitted to Local Planning Authorities on this matter and to give contractors/consultants a point of reference to obtain approval for such work from their client.

The verification of gas protection systems should be an integral part of remediation and agreed between developers and Local Planning Authorities at an early stage in the development.

Failure to comply with this guidance may result in delays to the development. Relevant planning conditions cannot be discharged until the Local Planning Authority is satisfied appropriate verification has been undertaken to confirm that the development is safe.

Available UK guidance regarding gas risk assessment includes:

- CIRIA C665 Assessing risks posed by hazardous ground gases to buildings;
- NHBC Report Edition No: 4 Guidance on evaluation of development proposals on sites where methane and carbon dioxide are present;
- BS 8485:2015 Code of practice for the design of proactive measures for methane and carbon dioxide ground gases for new buildings.

In particular, readers of this document should refer to the detailed guidance on verification published by CIRIA (CIRIA C735 Good Practice on the testing and verification of protection systems for buildings against hazardous ground gases, 2014). This guidance note should be considered as supplementary advice to be used in conjunction with these documents.

This document does not cover risks associated with radon. Please contact individual Local Planning Authority for further information.

The following YALPAG technical guidance documents for developers, landowners and consultants are also available;

- Verification Requirements for Cover Systems.
- Development on Land Affected by Contamination.

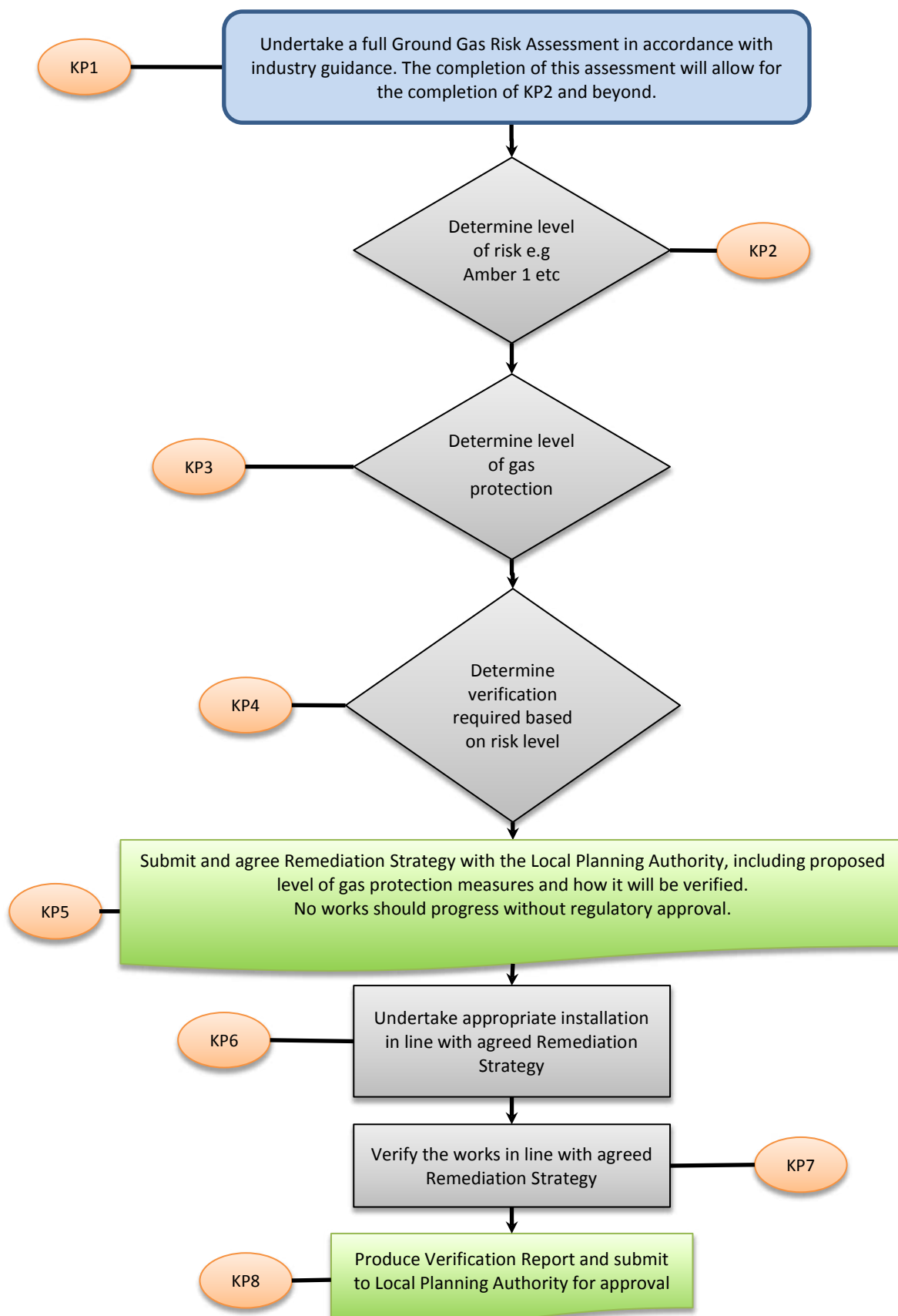
The Process of Verification

Implementation and verification plans for gas protection systems should always be site specific and based on the gas risk assessment and conceptual site model (CSM) for the site in question.

For gas protection systems, acceptable verification will normally comprise the provision of clear evidence that the level of protection is appropriate to the established risk and has been installed by suitably experienced personnel in line with the manufacturer's instructions and appropriate guidance. Critical factors to be considered are:

- What should be installed?
- How should it be installed?
- Who should install it?
- How will correct installation be demonstrated?

Overview Flowchart



Key Points

KP1 Ground Gas Risk Assessment	Undertake an appropriate gas risk assessment for the site in accordance with industry guidance*. On completion of the risk assessment and the generation of the appropriate Gas Screening Value (where required) and on a full understanding of the gas regime/ CSM, move to KP2 to determine the level of risk for the site. <i>*Where the desk study has identified the need for gas monitoring to be carried out it would always be expected that site specific gas monitoring data would be used in the gas risk assessment.</i>
KP2 Level of Risk	The level of gas risk needs to be determined by using the appropriate gas guidance document/s relative to the development (e.g. low rise housing, residential apartment blocks with areas of public open space, commercial or public buildings etc). For example Amber 1 (Low rise housing) equates to Low Risk in Table A1 CIRIA 735. Once the level of risk has been determined move to KP3 and determine the appropriate level of gas protection.
KP3 Level of Gas Protection	The level of gas protection should be based on the level of risk established by the gas risk assessment and CSM. It should provide the appropriate gas protection for the <i>lifetime of the development</i>. Detailed specification of gas protection measures in accordance with appropriate guidance to include (but not be limited to): • Submission of appropriate drawings (site specific plans and details to clearly show where the measures will be installed and how they fit into the design of the building and foundations). • Full written description of the protection measures to be included. • Detailed justification of the protection measures being used along with reference to the guidance document(s) being used.
KP4 Level of Verification Required	The level of qualification and experience of the installer will determine the level of verification required. Verification should always be carried out by an appropriate independent person such as an experienced and suitably trained verification consultant or third party qualified and experienced installer (see KP6). See Appendix 1 for full details of verification requirements for installation of gas protection measures and the associated verification requirements.

KP5 Submission and Agreement of Remediation Strategy	No installation of gas protection measures should be carried out at the site until the full details (KP1 to KP4) have been approved by the Local Planning Authority and formalised in an agreed Remediation Strategy (including Verification Plan). The Remediation Strategy, incorporating the detailed Verification Plan, should include (but not be limited to): • A summary of the ground gas risk assessment. • The gas protection measures proposed. • Who will undertake the installation including levels of experience and/ or qualifications. • How the works will be verified/ tested and by who. • How the works will be reported to the Local Planning Authority. See Appendix 2 for details of Remediation Strategy requirements.
KP6 Installation of Gas Protection	Installation should only be done once the Remediation Strategy has been agreed with the Local Planning Authority and should be carried out in line with the agreed Remediation Strategy. Any deviation away from the agreed Remediation Strategy should be agreed in writing with the Local Planning Authority prior to commencement of installation. See Appendix 4 for examples of good and poor gas protection installation.
KP7 Verification of Gas Protection	The verification of the gas protection measures should be undertaken in accordance with the Verification Plan set out in the agreed Remediation Strategy. Any deviation to works away from the agreed Remediation Strategy should be agreed in writing with the Local Planning Authority prior to installation. See Appendix 5 for an example Verification proforma.
KP8 Submission of Verification Report	The Verification Report must be produced in line with the agreed Remediation Strategy and Verification Plan. All aspects of the Remediation Strategy must be addressed in the Verification Report along with full details and justification of any deviation. See Appendix 3 for details of the required contents of the Verification Report. Please note, the required contents should be agreed within the submitted and approved Remediation Strategy at KP 5.

Appendix 1 – Requirement for Installation and Verification

Copied directly from Annex 1 CIRIA C735

Mallett, H, Cox (nee Taffel-Andureau), L, Wilson, S, Corban, M (2014) Good practice on the testing and verification of protection systems for buildings against hazardous ground gases, CIRIA, C735, London (ISBN: 978-0-86017-739-5). Go to: www.ciria.org

The tables in this appendix should be used for guidance only and are not intended to be used in lieu of sound professional judgment, which should take into account the risk factors affecting the development (the gas regime, the number of buildings, the complexity of design, and the expertise of the installation workforce) on a site-specific basis. The tables should not be used independent of, and without reference to, the accompanying text in the main guide C735.

Situation A – all development types except situation B – non reinforced slabs (from Wilson et al, 2007)

Gas regime/risk	Slab type	Installer experience	Suggested levels of verification and integrity testing
Low risk CS2 (*with venting) Basic radon protection area	Non reinforced All slabs	General builder/groundworker/landfill operative (no relevant qualification ¹)	Verifier (consultant ⁴ or qualified and experienced installer ¹) to conduct a thorough verification (visual) inspection prior to all concrete pours. Contractor to supply sign off sheets (verification evidence) including photographs to independent verifier.
		Qualified ¹ and experienced installer (minimum one operative to hold qualification)	Verifier (consultant ⁴ or third party qualified and experienced installer) to conduct a thorough verification (visual) inspection prior to 25 to 50 per cent of concrete pours (min one visit). Installer to supply sign off sheets (verification evidence) including photographs to independent verifier for all other pours.
Intermediate risk CS2 (no venting) or CS3 (*with venting) Full radon protection area		General builder/groundworker/landfill operative (no relevant qualification ¹)	Verifier (consultant ⁴ or qualified and experienced installer ¹) to conduct a thorough verification (visual) inspection prior to all concrete pours. All joints, pipe penetrations etc independently air lanced to ASTM D4437. Contractor to supply sign off sheets (verification evidence) including photographs to verifier. Consideration given to need for/scope of integrity testing (eg initially on say 25 to 50 per cent of pours then falling to 10 to 25 per cent if acceptable results obtained and no concerns raised by visual inspections).
Gas regime/risk	Slab type	Installer experience	Suggested levels of verification and integrity testing
Intermediate risk CS2 (no venting) or CS3 (*with venting) Full radon protection area	Non reinforced All slabs	Qualified ¹ and experienced installer (minimum one operative to hold qualification)	Verifier (consultant ⁴ or third party qualified and experienced installer ¹) to conduct a thorough verification (visual) inspection prior to 25 to 50 per cent of concrete pours (min two visits). 25 per cent all joints, pipe penetrations etc independently air lanced to ASTM D 4437. Remaining 75 per cent joints, pipe penetrations etc tested to recognised standard by installer (as detailed in method statement/CQA plan). Installer to supply sign off sheets (verification evidence) to verifier for all other pours. Consideration given to need for/scope of integrity testing (eg initially on 10 to 25 per cent of pours then falling to 0 to 10 per cent if acceptable results obtained and no concerns raised by visual inspections).
High risk VOCs etc CS3 (no venting) or CS4 and above (*with venting)		Qualified ¹ and experienced installer (50 per cent of operatives to hold qualification)	Verifier (consultant ⁴ or third party qualified and experienced installer ¹) to conduct a thorough verification (visual) inspection prior to all concrete pours. All joints, pipe penetrations independently air lanced to ASTM D 4437. Installer to supply sign off sheets (verification evidence) to verifier for all pours. Consideration given to need for scope of integrity testing (eg initially on 25 to 50 per cent of pours then falling to 10 to 25 per cent if acceptable results obtained and no concerns raised by visual inspections).

Notes

* Assumes venting designed to keep steady state concentration of CH₄ below one per cent in void, sites designed with higher levels of gas in the void should adjust the frequency of inspection and testing as appropriate

- 1 Relevant qualification is NVQ Level 2 in gas protection installation (see Section 3.3).
- 2 Before works start the contractor should produce a detailed installation plan including method statement, CQA procedures and qualifications, on receipt of these the verification protocol could be increased or reduced.
- 3 Consideration should be given to carrying out leak detection (ie smoke, tracer gas or dielectric testing) on the first plots on higher end sites CS3 and above. If an unacceptable amount of holes are found during these tests then the verification consultant should discuss with the relevant personnel, strategies to prevent this occurring, these could include changing material, improving subgrade preparation, putting up warning signs to reduce the amount of trafficking etc.
- 4 Verification consultant should be competent, experienced and suitably trained (see Section 3.2). A statement detailing their qualifications and relevant experience should be included in the verification plan.
- 5 Air lancing is the only integrity test that has an independently recognised international standard that is suitable for testing taped and welded seams.

Situation A – all development types except situation B – reinforced slabs (from Wilson et al, 2007)

Gas regime/risk	Slab type	Installer experience	Suggested levels of verification and integrity testing
Low risk CS2 (*with venting) Basic radon protection area	Reinforced All slabs	General builder/ groundworker/ landfill operative (no relevant qualification ¹)	Verifier (consultant ⁴ or qualified and experienced installer ¹) to conduct a thorough verification (visual) inspection prior to all concrete pours. Contractor to supply sign off sheets (verification evidence) including sub grade acceptance forms and photographs to independent verifier.
		Qualified ¹ and experienced installer (minimum one operative to hold qualification)	Verifier (consultant ⁴ or third party qualified and experienced installer ¹) to conduct a thorough verification (visual) inspection prior to 25 per cent concrete pours (min two visits), including vented void, subgrade etc. Installer to supply sign off sheets (verification evidence) including, sub grade acceptance forms, photographs to independent verifier for all other pours.
Intermediate risk CS2 (no venting) or CS3 (*with venting) Full radon protection area		General builder/ groundworker/ landfill operative (no relevant qualification ¹)	Verifier (consultant ⁴ or qualified and experienced installer ¹) to conduct a thorough verification (visual) inspection prior to all concrete pours including vented void, subgrade etc. All joints, pipe penetrations etc independently air lanced to ASTM D4437. Consideration given to the need for and scope of integrity testing (eg initially on say 50 to 25 per cent of pours then falling to 25 to 10 per cent if acceptable results obtained and no concerns raised by visual inspections).
		Qualified ¹ and experienced installer (minimum one operative to hold qualification)	Verifier (consultant ⁴ or third party qualified and experienced installer ¹) to conduct a thorough verification (visual) inspection prior to 50 per cent of concrete pours, including vented void, subgrade etc 25 per cent of joints, pipe penetrations etc independently air lanced to ASTM D4437. Remaining joints, pipe penetrations, corners etc tested to a recognised standard by installer (as detailed in method statement and CQA plan). Installer to supply sign off sheets (verification evidence) including, sub grade acceptance forms, photographs etc to independent verifier for all other pours. Consideration given to need for/scope of integrity testing (eg initially on 10 to 25 per cent of pours then falling to 0 to 10 per cent if acceptable results and no concerns raised by visual inspections).
		High risk VOC and hydrocarbons CS3 (no venting) or CS4 and above (*with venting)	Qualified ¹ and experienced installer (50 per cent of operatives to hold qualification)

Notes

- * Assumes venting designed to keep steady state concentration of CH₄ below one per cent in void, sites designed with higher levels of gas in the void should adjust the frequency of inspection and testing as appropriate.
- 1 Relevant qualification is NVQ Level 2 in gas protection installation (see Section 3.3).
 - 2 Before works start the contractor should produce a detailed installation plan including method statement, CQA procedures and qualifications, on receipt of these the verification protocol could be increased or reduced.
 - 3 Consideration should be given to carrying out leak detection (ie smoke, tracer gas or dielectric testing) on the first plots on higher end sites CS3 and above. If an unacceptable amount of holes are found during these tests then the verifier should discuss with the relevant personnel, strategies to prevent this occurring, these could include changing material, improving subgrade preparation, putting up warning signs to reduce the amount of trafficking etc.
 - 4 Verification consultant should be competent, experienced and suitably trained (see Section 3.2). A statement detailing their qualifications and relevant experience should be included in the verification plan.
 - 5 Air lancing is the only integrity test that has an independently recognised international standard that is suitable for testing taped and welded seams.

- 6 Where a sufficiently robust protection layer (protection fleece, protection boards or insulation) are laid directly on the membrane, inspection after placement of the reinforcement should not be necessary.

Situation B – low rise housing with ventilated void (from NHBC and Wilson et al, 2007)

Gas regime/risk	Slab type	Installer experience	Suggested levels of verification and integrity testing
Low risk Amber 1	All slabs with min 150 mm ventilated sub floor void	General builder/ groundworker/ landfill operative (no relevant qualification ¹)	Verifier (consultant ⁴ or qualified and experienced installer ¹) to conduct thorough verification (visual) inspection of first plot and after placement of reinforcement if no protection provided. Subsequent inspections carried out at approx. frequency of 1 in 10 plots (minimum 5). Contractor to supply sign off sheets (verification evidence) including photographs for all other plots. Consideration given to need for/scope of integrity testing if concerns identified by visual inspections ³ .
		Qualified ¹ and experienced installer (minimum one operative to hold qualification)	Verifier (consultant ⁴ or third party qualified and experienced installer ¹) to conduct thorough verification (visual) inspection of first plot and after placement of reinforcement if no protection provided. Subsequent inspections carried out at approx. frequency of 1 in 20 plots. Contractor to supply sign off sheets (verification evidence) including photographs for all other plots. Consideration given to need for/scope of integrity testing if concerns identified by visual inspections ³ .
Intermediate risk Amber 2		General builder/ groundworker/ landfill operative (no relevant qualification ¹)	Verifier (consultant ⁴ or qualified and experienced installer ¹) to conduct thorough verification (visual) inspection of first 10 plots and after placement of reinforcement if no protection provided. All joints, pipe penetrations etc air lanced to ASTM D4437. Subsequent inspections (including air lancing) carried out at approx. frequency of 1 in 20 plots Contractor to supply sign off sheets (verification evidence) including photographs for all other plots. Consideration given to need for/scope of integrity testing (eg initially on 30 to 50 per cent of plots then falling to 0 to 10 per cent of plots if acceptable results obtained and no concerns raised by visual inspections).
		Qualified ¹ and experienced installer (minimum one operative to hold qualification)	Verifier (consultant ⁴ or third party qualified and experienced installer ¹) to conduct thorough verification (visual) inspection of the first 5 plots and after placement of reinforcement if no protection provided. All joints, pipe penetrations etc air lanced to ASTM D4437. Subsequent inspections (including air lancing) carried out at a frequency of about 1 in 20 plots. Contractor to supply sign off sheets (verification evidence) including photographs for all other plots. Consideration given to need for/ scope of integrity testing (eg initially on 10 to 25 per cent of plots then falling to 0 5 per cent of plots if acceptable results obtained and no concerns raised by visual inspections) ³ .
High risk Red VOC and hydrocarbons		Qualified ¹ and experienced installer (all operatives to hold qualification)	Verifier (consultant ⁴ or third party qualified and experienced installer ¹) to conduct thorough verification (visual) inspection of all plots, and after placement of reinforcement if no protection provided. All joints, pipe penetrations etc air lanced to ASTM D4437. Consideration given to need for/scope of integrity testing (eg initially on 30 to 50 per cent of plots then falling to 0 to 10 per cent of plots if acceptable results obtained and no concerns raised by visual inspections) ³ .

Notes

- * Gas regime defined by characteristic situation as set out by Wilson et al (2007), and all other recent good practice guidance and British Standards.
- ** Assumes venting designed to keep steady state concentration of CH₄ below one per cent in void, sites designed with higher levels of gas in the void should adjust the frequency of inspection and testing as appropriate.
- 1 Relevant qualification is NVQ Level 2 in gas protection installation (see Section 3.3).
- 2 Before the works start the contractor should produce a detailed installation plan including method statement, CQA procedures and qualifications, on receipt of these the verification protocol could be increased or reduced.
- 3 Consideration should be given to carrying out integrity testing/leak detection (ie smoke, tracer gas or dielectric testing) on the above basis and/or if an unacceptable amount of damage/loss of integrity is found during visual inspections. In this instance the consultant should discuss with the relevant personnel, strategies to prevent this recurring. This could include changing material, improving subgrade preparation, putting up warning signs to reduce the amount of trafficking etc.
- 4 Verification consultant should be competent, experienced and suitably trained (see Section 3.2). A statement detailing their qualifications and relevant experience should be included in the verification plan.
- 5 Air lancing is the only integrity test that has an independently recognised international standard suitable for testing taped and welded seams and should be used at the frequency suggested in the table.

Appendix 2 – Remediation Strategy and Verification Plan for Gas Protection Systems

The Remediation Strategy should include a detailed verification method statement. This should address how the gas protection measures will be installed and what verification information will be provided to demonstrate the installation has been carried out in accordance with the appropriate guidance.

As a minimum the report should include (but not be limited to):

- A summary of the gas risk assessment.
- The gas protection measures proposed (including reference to the appropriate guidance documents) and confirmation they will meet the gas protection requirements for the lifetime of the development.
- Technical drawings showing how the gas protection measures will be incorporated.
- Formal qualifications/experience/training of the person carrying out the installation.
- Formal qualifications/experience/training of the person carrying out the verification.
- Clear demonstration of the independence of the person carrying out the verification.
- The manufacturer's specification of the gas protection membrane to be used.
- Full details of what the verification process will comprise and at what stage verification will be carried out.
- Details of how any non-conformance will be dealt with.
- Details of the number of plots to be validated. (Deviation from verification of every plot will need to be justified and agreed with the Local Planning Authority in line with Appendix 1 of this document).
- Timeline of when during the build, each of the gas protection measures will be installed.
- Details of management measures proposed to ensure how damage to the membrane will be prevented prior to the floor being installed, post installation.
- Details of how all site personnel (including follow on trades) will be made aware of the presence of the membrane and that damage to the membrane must be prevented.
- Details of the extent of overlap and method of sealing (these must be in line with manufacturer's instructions and evidence provided).
- Confirmation that a signed (plot specific unless agreed otherwise) statement confirming that the gas protection measures were installed as agreed and that the membrane was free from tears and punctures and was lapped and sealed as agreed at joins and around services and sub floor voids were clear and free from debris will be included in the Verification Report.
- Confirmation that plot specific photographs showing the installed membrane will be included in the Verification Report.

Appendix 3 – Checklist for Gas Verification Reports

The Verification Report should include a summary of all the works undertaken, relating to gas protection measures including all elements detailed within the Remediation Strategy.

As a minimum the report should include (but not be limited to):

- Site details.
- Planning Application details.
- Summary of Gas Risk Assessment (including original CSM).
- Details of who carried out installation (qualifications/experience/training).
- Details of who carried out verification (qualifications/experience/training).
- Description of protection measures installed with reference to method statements and drawings and manufacturers specification of the materials used.
- Details of the verification inspection regime.
- Supporting information, plans, air vent installation, photographs, as built drawings.
- Summary of verification data (completed proformas, test results)
- Details of non-conformances and how they were rectified.
- Clear statement saying remedial objectives been achieved supported by lines of evidence including reference to CSM.
- Where necessary further works and/ or long term management.

Appendix 4 – Examples of Good and Poor Installation

Copied directly from Appendix A4 CIRIA C735

Mallett, H, Cox (nee Taffel-Andureau), L, Wilson, S, Corban, M (2014) Good practice on the testing and verification of protection systems for buildings against hazardous ground gases, CIRIA, C735, London (ISBN: 978-0-86017-739-5). Go to: www.ciria.org

GOOD PRACTICE PHOTOGRAPHS



Figure A4.7 Geovent protruding out of the frontage of the unit. Gas membrane along the sides of the slab preventing lateral gas ingress (courtesy Alderburgh Group)



Figure A4.8 Geovent beneath the 2000g taped gas membrane lined up with collector pipes (courtesy Alderburgh Group)



Figure A4.9 On site schematics to aid construction workers build the gas protection system (courtesy Alderburgh Group)



Figure A4.10 Almost complete coverage available for inspection, minimal jointing, service entries suitable distance from walls, light traffic (courtesy Smith Grant)



Figure A4.11 Gas membrane continued through cavity wall and above air bricks (courtesy Hydrock)



Figure A4.12 Good edge detail across cavity (courtesy PAGEotechnical Ltd)



Figure A4.13 Gas proof DPC adhered on top of gas membrane using butyl strips across cavity space (courtesy NHBC)



Figure A4.14 Good perimeter seal (courtesy PAGEotechnical Ltd)



Figure A4.15 LDPE type gas membrane overlap and double sided tape. Sand blinding to protect underside of gas membrane (courtesy A Proctor Group)



Figure A4.16 Example HDPE type gas membrane and steam roller used to ensure self-adhesive tape is correctly installed (courtesy A Proctor Group)

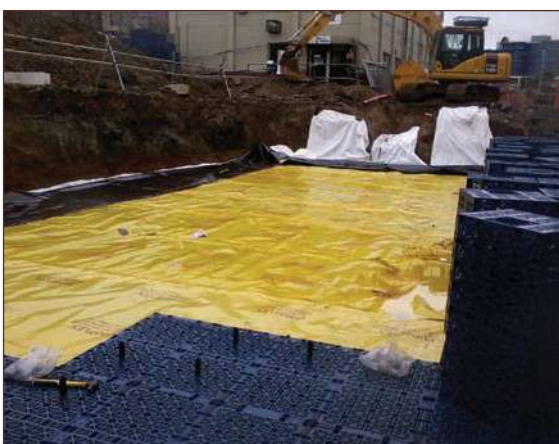


Figure A4.17 Gas membrane installed in attenuation tank (courtesy Industrial Textiles & Plastics Ltd)



Figure A4.18 Gas membrane installed as part of foundation barrier (courtesy Industrial Textiles & Plastics Ltd)

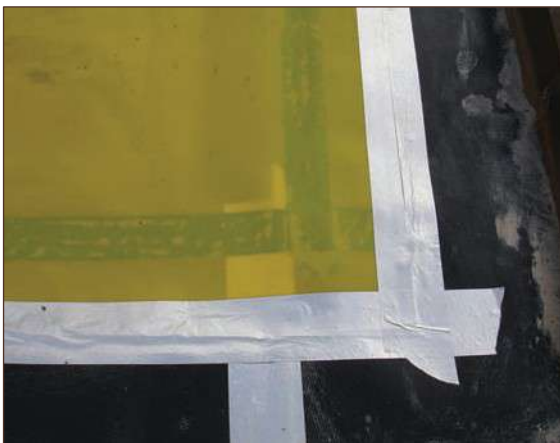


Figure A4.19 Well-constructed joints with gas resistant DPC, lap and double sided butyl joints visible beneath semi-transparent gas membrane, secondary seal with proprietary single sided tape (courtesy Smith Grant)

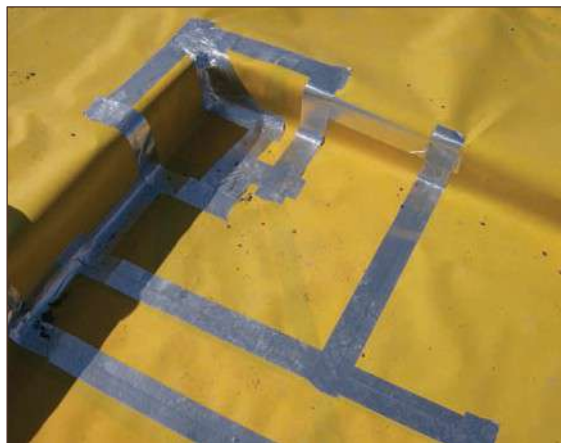


Figure A4.20 A pre-formed corner unit would have been preferable as fewer joints would have been formed, however the installer has achieved a good level of workmanship in this corner detail (courtesy Smith Grant)



Figure A4.21 Good prefabricated corner detail (courtesy MEC Environmental Ltd)

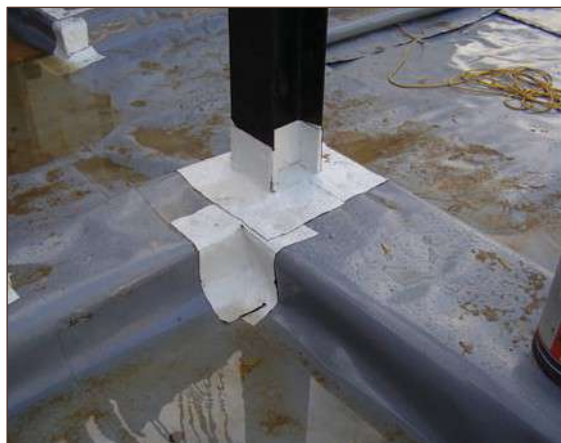


Figure A4.22 Good detail around stanchion and corner (courtesy PAGeotechnical Ltd)



Figure A4.23 Complex column seal (courtesy PAGeotechnical Ltd)

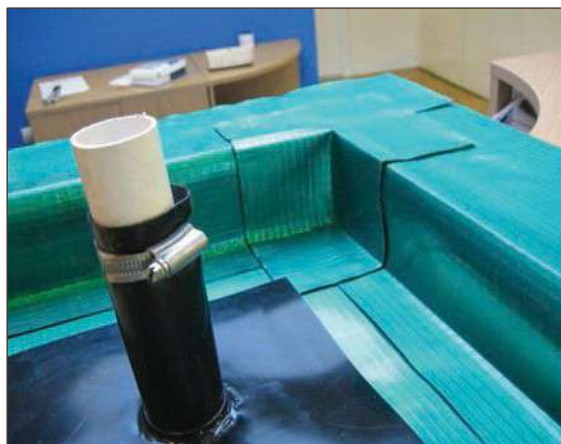


Figure A4.24 Prefabricated corner detail and top hat (courtesy A Proctor Group)

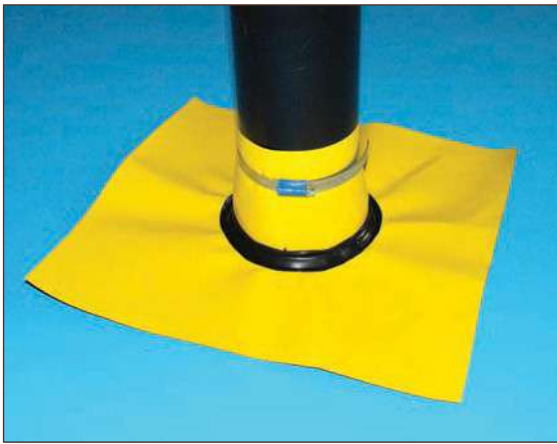


Figure A4.25 Top hat around service entry (courtesy Industrial Textiles & Plastics Ltd)



Figure A4.26 Well-constructed service entry: top hat fits well with service pipe and taped down to gas membrane, secondary seal with proprietary single sided tape (courtesy Smith Grant)



Figure A4.27 Top hats placed around service entries secured with jubilee clip seals. Top hats secured to gas membrane with double sided butyl tape (courtesy Hydrock)



Figure A4.28 Bead of double sided butyl tape provided between interfaces of ID top hat and OD service pipe. When compressed with jubilee clip, forms an effective seal (courtesy Smith Grant)



Figure A4.29 Extrusion welding technique (courtesy Industrial Textiles & Plastics Ltd)



Figure A4.30 Thermal welding technique (courtesy Industrial Textiles & Plastics Ltd)



Figure A4.31 Extrusion welding (courtesy PAGeotechnical Ltd)



Figure A4.32 High quality installation of liquid gas membrane to lift pits, including resin gas protection on all screw penetrations (courtesy Card Geotechnics Limited)

A4.2.2 Good practice – passive venting systems



Figure A4.33 Good ventilation in internal sleeper walls, cast into prefabricated beams (courtesy Smith Grant)



Figure A4.34 Open void >300mm deep, good ventilation through internal sleeper walls (courtesy Smith Grant)



Figure A4.35 Good installation of passive gas venting trenches and 'egg-crate' (courtesy Card Geotechnics Limited)



Figure A4.36 Raised air bricks are preferable due to the reduced potential for blockade but the vent trench specified is provided with clean single sized stone (courtesy Smith Grant)

A4.2.3 Good practice – integrity testing



Figure A4.37 Tracer gas testing, whereby gas or smoke is applied under pressure beneath the installed gas membrane and detectors are used to screen for leaks above (courtesy NHBC)



Figure A4.38 Tracer gas testing (courtesy PAGEotechnical Ltd)



Figure A4.39 Scanning for leaks (courtesy PAGEotechnical Ltd)



Figure A4.40 CO₂ injection integrity testing (courtesy Landline Ltd)



Figure A4.41 Small sand bags are marking holes made in the gas membrane used to check whether injected CO₂ has worked its way beneath whole area (courtesy Landline Ltd)



Figure A4.42 Air pressure testing (courtesy GSE Environmental)



Figure A4.43 Dielectric porosity testing for housing scheme (courtesy NHBC)



Figure A4.44 Air lance test, used to test the quality of welded seams along gas membrane joints (courtesy MEC Environmental Ltd)



Figure A4.45 Spark testing (courtesy GSE Environmental)



Figure A4.46 Testing a weld with 'dog bone' grips (courtesy MEC Environmental Ltd)

BAD PRACTICE PHOTOGRAPHS



Figure A4.47 Follow-on works purposefully penetrating gas membrane (courtesy Card Geotechnics Limited)



Figure A4.48 Loose nails and over construction debris likely to be left in place beneath gas membrane – poor preparation of gas membrane prior to sealing service penetration (courtesy Card Geotechnics Limited)



Figure A4.49 *Lifted gas membrane at corner position. Light penetrating through confirms damage to aluminium internal core layer (courtesy NHBC)*



Figure A4.50 *Large/heavy/sharp objects being moved over unprotected gas membrane (courtesy Card Geotechnics Limited)*



Figure A4.51 *Gas membrane torn by reinforcement (courtesy MEC Environmental Ltd)*



Figure A4.52 *Gas membrane cut by scaffolders and bricklayers after installation (courtesy MEC Environmental Ltd)*



Figure A4.53 *Gas membrane left exposed for long period of time, shows significant fraying at cavity edge (courtesy NHBC)*



Figure A4.54 *Gas membrane damage/tearing at edge of ground floor slab screed layer where it was left exposed to elements for period of time (courtesy NHBC)*



Figure A4.55 Gas membrane at stepped junction of slab to integral garage, appears to be susceptible to tearing when screed is poured. Screed may also weigh down on gas membrane if fitted too tight (courtesy NHBC)



Figure A4.56 Gas membrane at edge of concrete screed. Screed has been grinded to achieve desired levels, gas membrane shows extreme wear and damage as a result (courtesy NHBC)



Figure A4.57 Unprotected gas membrane damaged by heavy traffic (courtesy MEC Environmental Ltd)



Figure A4.58 Damage caused to gas membrane by follow-on trade who cut/shaped the dry lining board directly on the unprotected installed gas membrane (courtesy NHBC)



Figure A4.59 Gas membrane slit at the bottom of a cavity tray to enable water to drain away (courtesy Smith Grant)



Figure A4.60 Some stones could penetrate gas membrane if sufficient force is applied (courtesy Smith Grant)



Figure A4.61 'Stripping' occurs on gas membranes that contain aluminium foil. The foil gets too hot under the outer layer of LDPE or PP and the top layer of the gas membrane sticks to the roller which strips it off, leaving the aluminium completely exposed (courtesy MEC Environmental Ltd)

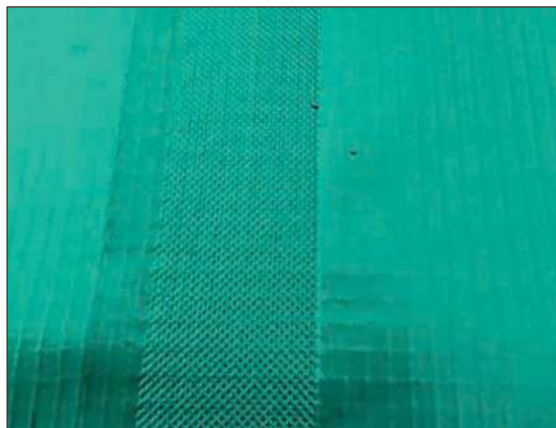


Figure A4.62 Wedge weld on an LDPE aluminium gas membrane, where the installer used metal nip rollers. This destroyed the top layer and probably the bottom layer, leaving aluminium exposed between the weaves. This failed dielectric testing along all joints (courtesy MEC Environmental Ltd)

A4.3.2 Bad practice – gas membranes installed incorrectly



Figure A4.63 Absence of surface preparation prior to laying of gas membrane, debris likely to pierce gas membrane (courtesy Card Geotechnics Limited)



Figure A4.64 Insufficient length of gas membrane protruding through wall to overlap with gas membrane within building (courtesy Card Geotechnics Limited)



Figure A4.65 Wrinkling of gas membrane over joint has resulted in gaps (only visible due to the use of a transparent gas membrane) and the secondary seal uses ordinary gaffer tape rather than a proprietary product (courtesy Smith Grant)



Figure A4.66 Follow-on trades proceeded work before gas membrane joints sealed (courtesy Card Geotechnics Limited)



Figure A4.67 Traffic over mesh resulted in several punctures, in addition most joints were found to be poorly constructed. Taped joints are difficult to construct in adverse weather (courtesy Smith Grant)



Figure A4.68 A pre-formed corner unit would have been preferable. The installer could not produce sufficient quality despite the amount of tape applied (courtesy Smith Grant)



Figure A4.69 Attempt at corner detailing using non-proprietary duct tape (courtesy Smith Grant)



Figure A4.70 Inadequate corner detailing. The use of preformed proprietary products would have avoided such bad practice (courtesy NHBC)



Figure A4.71 No corner detailing leading to stress point on gas membrane (courtesy Smith Grant)



Figure A4.72 Joint between top hat and gas membrane has lifted due to poor fit and attempt to construct in very wet conditions (courtesy Smith Grant)



Figure A4.73 No bead of double sided butyl tape provided between interfaces of ID top hat and OD service pipe: cannot be compressed enough to form seal (courtesy Smith Grant)



Figure A4.74 Gap between OD of service pipe and ID of top hat too large: cannot be compressed enough to form seal, even with the application of additional tape (courtesy Smith Grant)



Figure A4.75 Jubilee clip on service entry insufficiently tightened so joint is uncompressed (courtesy Smith Grant)



Figure A4.76 No double sided tape used in joints (courtesy Smith Grant)



Figure A4.77 Small lap and no single sided tape used to achieve secondary seal (courtesy Smith Grant)



Figure A4.78 Gap in jointing over wall cavity big enough to insert fist (courtesy Smith Grant)



Figure A4.79 Gas membrane not continuous over internal wall. It had been deliberately cut open for unknown purpose (courtesy Smith Grant)



Figure A4.80 Column left unsealed (courtesy PAGEotechnical Ltd)



Figure A4.81 No seal to perimeter pipe (courtesy PAGEotechnical Ltd)



Figure A4.82 Gas membrane used to bridge cavity wall instead of DPC, leaving it exposed to damage by follow-on trades (courtesy Smith Grant)



Figure A4.83 Poor quality installation of liquid gas membrane. Liquid gas membranes come in two colours (black and white) allowing coverage of each coat to be easily assessed. Here the gas membrane has been spread too thinly and inconsistently. In addition, it appears to have been applied to a damp surface, causing blistering (courtesy Card Geotechnics Limited)



Figure A4.84 Taped joints are difficult to construct in adverse weather. Also difficult to inspect if covered with snow (courtesy Smith Grant)

A4.3.3 Bad practice – passive venting systems



Figure A4.85 Clean single sized stones with no fines acting as venting media, however no ventilation gaps in internal sleeper walls (courtesy Smith Grant)



Figure A4.86 Cavity is becoming blocked with detritus. The vent holes in the beam are no longer visible (courtesy Smith Grant)



Figure A4.87 Tape joint with crease running through and air bubbles where gas membrane not in complete contact with tape. Rollers should have been used to produce a consistent seal (courtesy MEC Environmental Ltd)



Figure A4.88 Ventilator becoming detached to fit to external block work. This is due to builders requiring increased cavity widths to achieve thermal properties expected by Building Regulations (courtesy NHBC)



Figure A4.89 No ventilation in internal sleeper wall (courtesy Smith Grant)

Appendix 5 –Verification Proforma

Copied Directly From Appendix A5 CIRIA C735

Mallett, H, Cox (nee Taffel-Andureau), L, Wilson, S, Corban, M (2014) Good practice on the testing and verification of protection systems for buildings against hazardous ground gases, CIRIA, C735, London (ISBN: 978-0-86017-739-5). Go to: www.ciria.org

VISUAL INSPECTION OF GAS PROTECTION MEASURES

Site name:		Gas characteristic situation:
Job number:		Type of development and building/block checked: (residential/commercial/other)
Date:		Building description:
Visit by:		Foundation type: (suspended floor/raft/other)
Weather at time of inspection:		Gas protection type: passive/active

No.	Item	Comments (see notes)
1 Gas membrane		
1.1	Condition of sub-grade and underside of gas membrane	
1.2	Gas membrane type	
1.3	Gas membrane condition	
1.4	Joining tape product	
1.5	Lapping design	
1.6	Laps, welds and joints seals	
1.7	Service entries seals	
2 Passive venting		
2.1	Sub-floor void	
2.2	External wall airbricks	
2.3	Internal sleeper walls	
2.4	External vent trenches/ducts	
3 Active venting		
3.1	System details	
Additional notes:		

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:

Signature:

Date:

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