



Geological & Geotechnical Consultants

Connell Coop College

Gas membrane installation verification report

Prepared for Darwin Group Limited



Geological & Geotechnical Consultants

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Connell Coop College

Gas membrane installation verification report

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Appendix 1 Verification Record Sheet

Drawings

180389-DGL-01-ZZ-A-9101(P4) Ground Floor Interface – Brickwork High

1.0 Introduction

Key GeoSolutions Ltd have been commissioned by Darwin Group Limited to produce the Verification Report for the installation of the gas membrane beneath the new teaching block on the eastern side of the Connell Coop College site. The site address is Coop Connell College, Manchester M11 3BS.

The building is to provide additional classrooms for the college and is of modular construction with a brick skin outer leaf.

The report provides details of the installation and a record of the installation process.

2.0 Gas Membrane Details

The installation details for the membrane are shown on Darwin Group drawing number 180389-DGL-01-ZZ-A-9101(P4) which is included at the back of this report.

Ground investigation had identified the need for a gas membrane to be installed as a precautionary measure at the site due to the potential presence of carbon dioxide in the ground. During the excavation of the foundations for the building Made Ground encountered at the southern corner of the building was found to have raised levels of hydrocarbons and it was determined to be necessary to upgrade the gas membrane to one that could provide protection against VOC's.

The barrier selected was Visqueen Ultimate VOC Blok, a copy of the manufacturer's specification is included in Appendix 1 of this report.

In addition to the membrane a concrete ground bearing slab was installed over the membrane in order to provide a secondary level of protection and to prevent damage to the membrane at a later date.

A minimum 150mm deep vented sub-floor void is present between the top of the ground bearing slab and the underside of the modular building with telescopic vents installed at a maximum of 400mm centres.

3.0 Installation

3.1 Key Dates

Mass pad and strip foundations installed	-	mid May 2021
Two courses of blockwork laid around perimeter - (Photograph 5)	-	w/c 24 th May 2021
Gas membrane installed (Photograph 1)	-	29 th and 30 th May 2021
Ground bearing slab installed (Photographs 3 and 4)	-	2 nd June 2021
Building modules installed	-	10 th and 11 th June 2021
Four courses of brickwork laid around perimeter - to level of membrane termination (Photographs 6 and 7)	-	w/c 14 th June 2021

3.2 Gas Membrane Installation

The sub-grade was inspected to confirm that a suitable surface was present for the installation of the membrane, with no sharp objects / stones being present that could cause a puncture. A sand blinding was placed over the sub-grade prior to the membrane installation.

The membrane was jointed using mechanical welds with 100mm wide overlaps as per the manufacturer's specification, see photographs included with the Verification Record Sheet in Appendix 1. Three small punctures were repaired and verified at the time of installation (Photograph 2).

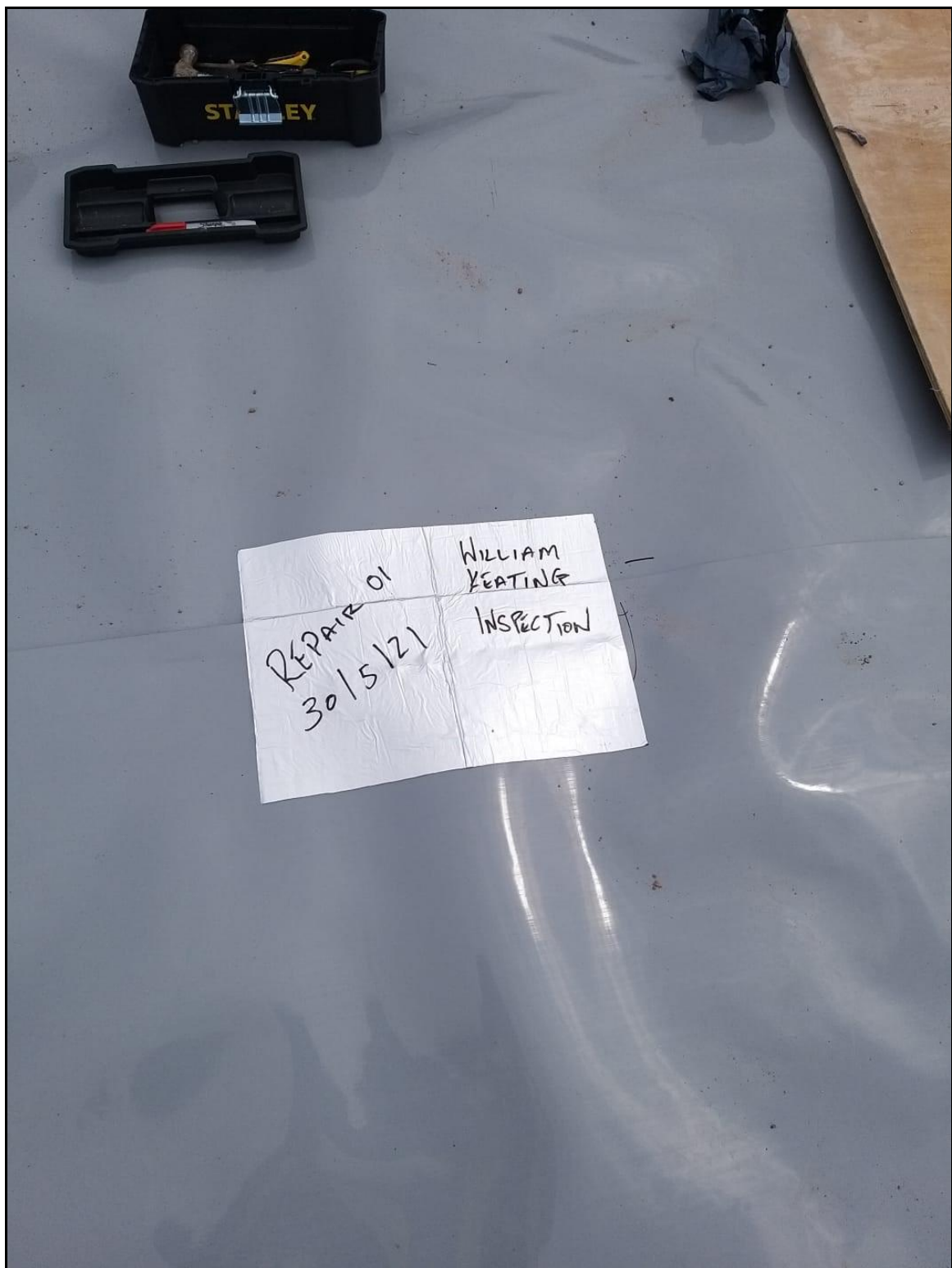
The pipe penetrations were sealed using Visqueen self-adhesive membrane.

The gas barrier was terminated on the fourth course of bricks, which is above the proposed final surrounding ground level.

PHOTOGRAPHS



Photograph 1 – View across gas membrane (30/05/21)



Photograph 2 – Example of puncture repair



Photograph 3 – installation of concrete ground bearing slab



Photograph 4 – Completion of concrete ground bearing slab



Photograph 5 – Edge detail showing blockwork which was used as formwork for the concrete slab, gas membrane fixed temporarily to the outside of the modules



Photograph 6 – Brickwork to gas barrier level



Photograph 7 – Gas barrier onto brick work, note sub-floor vent in top of photograph.

APPENDICES

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VERIFICATION RECORD SHEET

GAS CHARACTERISTIC SITUATION: CS2 Low	SITE NAME: Coop Connell College Manchester M11 3BS
SITE VISIT NO: 001	TYPE OF DEVELOPMENT AND BUILDING/BLOCK CHECKED RESIDENTIAL/COMMERCIAL/ ETC: Modular Build – School Usage
TIME/DATE: 09:00hrs	INSTALLERS INFORMATION: William Lawler NVQ2 Specialist Installer / Qualification Attached / Checked
SURVEYOR: William Keating Keating Projects Ltd	DESCRIPTION: Visqueen VOC Barrier Installed prior to covering with a 75mm Screed. Membrane Extremely robust due to being 1mm thick.
WEATHER AT TIME OF INSPECTION: 22c Sunny / Cloudy	GAS PROTECTION TYPE: PASSIVE/ACTIVE: Passive System – VOC Gas Barrier / Mechanically welded by a specialist Installation team

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1. GAS MEMBRANE

NO:	ITEM:	COMMENTS:
1.1	CONDITION OF SUBGRADE AND UNDERSIDE OF GAS MEMBRANE:	Checked that the sub grade did not contain rough/uneven surfaces, it was appropriately clean and that there were no hard/sharp objects. Protective sand blinding was Installed prior to the Gas Membrane being Installed
1.2	GAS MEMBRANE TYPE:	Visqueen Ultimate VOC BLOK - Conforms in full to CIRIA C748 and BS8485:2015 ➤ VOC/Hydrocarbon contaminated sites in accordance with CIRIA C748 ➤ Carbon dioxide and methane sites in accordance with BS8485:2015 ➤ Radon affected sites in accordance with BRE211:2015 ➤ Damp protection in accordance with Building Regulations part C
1.3	GAS MEMBRANE CONDITION:	The Gas Membrane condition was of an excellent stand 3 minor punctures were made by the Installation team. These were repaired and verified.
1.4	JOINING TAPE PRODUCT:	N/A – The System was mechanically welded
1.5	LAPPING DESIGN:	100mm Overlap as per manufacturers guidance
1.6	LAPS, WELDS, JOINTS, SEALS:	Prior to the installation a test weld was produced and tested. Example left with the site office
1.7	SERVICE ENTRY SEALS:	Pipe penetrations sealed using Visqueen Self-adhesive membrane – standard procedures followed by specialist installers.

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2. PASSIVE VENTING

2.1	SUB FLOOR VOID:	N/A
2.2	EXTERNAL WALL AIRBRICKS:	N/A
2.3	INTERNAL SLEEPER WALLS:	N/A
2.4	EXTERNAL VENTS TRENCHES, DUCTS:	N/A

3. ACTIVE VENTING

3.1	SYSTEM DETAILS:	
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ADDITIONAL NOTES

System was installed to an extremely high standard. Entire area was visually inspected (Pick & Probe)

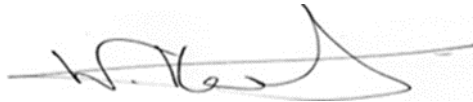
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THE GAS PROTECTION MEASURES INSPECTED:	
VISUAL AND PICK TEST STATUS: PASS	A: Are acceptable and comply with the Specification
	B: Are acceptable but attention is drawn to issues related to item No/s: _____
	C: Are not acceptable due to the issues related to item No/s: _____

VERIFIER

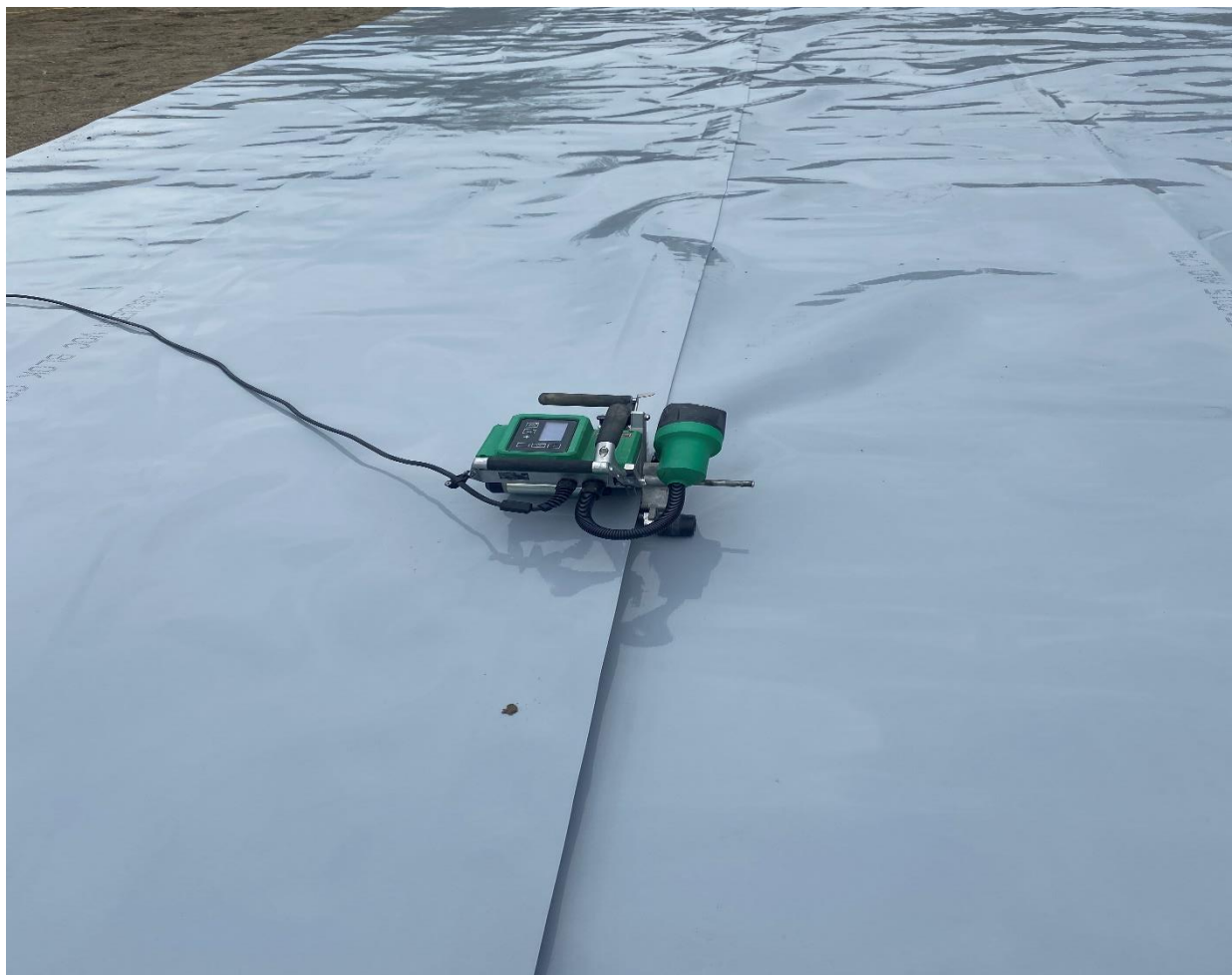
Name: William Keating Signature:



Date: 03/06/2021

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Mechanically welded using Twinny T5 Welder & Specialist Installers



Area overview – 1mtr overlap around entire perimeter to enable it to be lapped onto the modular building



Perimeter Edge detail



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This is to certify that

William Lawler

has achieved the following Qualification

**NOCN_Cskills Awards Level 2 NVQ Diploma
in Sub-structure Work Occupations
(Construction) - Installation of Gas
Membranes**



Qualification Approval No: 603/1279/8

ULN: 4616460751

Award Date: 06/05/2021

Certificate No: 47483479



Graham Hasting-Evans
Group Managing Director
NOCN Group



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William Lawler

Credit/s Awarded

Unit Title	Unit Code	Credit(s)	Level
Conforming to General Health, Safety and Welfare in the Workplace	A/503/1170	2	L1
Moving, Handling and Storing Resources in the Workplace	F/503/1171	5	L2
Conforming to Productive Working Practices in the Workplace	J/503/1169	3	L2
Preparing to install gas membranes in the workplace	K/615/6045	15	L2
Installing gas membranes in the workplace	M/615/6046	19	L2



Qualification Approval No: 603/1279/8
ULN: 4616460751
Award Date: 06/05/2021
Certificate No: 47483479



Graham Hasting-Evans
Group Managing Director
NOCN Group



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Visqueen Ultimate VOC Blok

Features and benefits

- Complies with CIRIA C748:2014 - industry standard for volatile organic compounds (VOC) protection
- Complies with BS 8485:2015 + A1:2019 - industry standard for methane and carbon dioxide protection
- High resistance to puncture - greatly reduces risk of barrier becoming damage during the build process
- 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 Ultimate VOC Blok is a 1mm robust chemically resistant co-extruded hydrocarbon, volatile organic compound and gas barrier. The barrier is coloured grey on the upper surface and black on the reverse. The product is supplied in single wound rolls (not folded), 2.44m x 41m.

Approvals and standards

- Complies with CIRIA C748:2014
- 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 Ultimate VOC Blok is suitable for use in all types of buildings to prevent the ingress of harmful levels of volatile organic compounds (VOCs). 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.

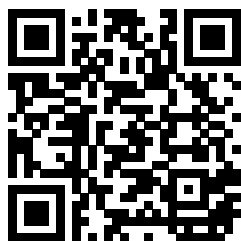
The barrier can also be used in all types of buildings to prevent the ingress of harmful levels of ground gases e.g. methane, carbon dioxide and radon. The barrier also acts as a damp proof membrane.

The barrier is suitable where hydrostatic pressure is present, however in this application the joints must be welded and not taped. For further guidance contact Visqueen Technical Services +44 (0) 333 202 6800

System components

- Visqueen Ultimate Double Sided Jointing Tape, 100mm x 15m
- Visqueen GR Lap Tape, 150mm x 10m
- Visqueen Ultimate Top Hat Units
- Visqueen Preformed Units
- VisqueenPro Detailing Strip, 300mm x 10m, 500mm x 10m

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NON-COMBUSTIBLE DPC

Visqueen Zedex Non-Combustible Damp Proof Course
A2 - s1, d0 to BS EN 13501-1:2018

Visqueen Ultimate VOC Blok

Storage and handling

Visqueen Ultimate VOC Blok 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 Ultimate VOC Blok 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 Ultimate VOC Blok should be loose laid on the substrate with the grey side up.

The barrier should be clean and dry at the time of jointing. It should be overlapped by at least 150mm, bonded with Visqueen Ultimate Double Sided Jointing Tape and sealed with Visqueen 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 Ultimate 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 Ultimate Double Sided Jointing Tape and sealed with Visqueen GR 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 Ultimate 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 Ultimate Double Sided Jointing Tape and sealed with Visqueen GR Lap Tape. Alternatively a patch can be formed using Visqueen Pro Detailing Strip and lapped at least 150mm beyond the extents of the puncture.

Due to the robust nature of the product, in normal service conditions the barrier does not require covering with a protective layer. However care should still 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.

In high temperature conditions the membrane should be covered immediately after installation.

Usable temperature range

It is recommended that Visqueen Ultimate VOC Blok and all associated system components should not be installed below 5°C.

Additional information

When used in accordance with CIRIA C748:2014 or BS8485:2015 + A1:2019, a subfloor ventilation system or pressure relief maybe required

Where a volatile organic compound (VOC) barrier is required for use above a precast suspended segmental ground floor system, e.g. beam and block floor, see Visqueen Ultimate HC Blok

To assist build sequencing, Visqueen Ultimate DPC is available for gas protection through the wall constructions

For suspended beam and block floor detailing see VOC-01

Visqueen Ultimate Preformed Top Hat Units should be used at service pipe penetrations see VOC-51

At internal and external corners Visqueen Ultimate Preformed Corner Units should be used see PFU-553

To seal around steel columns use Visqueen Pro Detailing Strip see VOC-52

For additional detailing information, contact Visqueen Technical Services +44 (0) 333 202 6800.

The information in this datasheet was correct at the time of publication. It is the user's responsibility to obtain the latest version of the datasheet as it is updated on a regular basis. The information contained in the latest datasheet supersedes all previously published editions.

Visqueen Ultimate VOC Blok

Property	Test method	Units	Criteria	Result	
Colour				Black/grey	
Weight		kg		97	
Length	EN 1848-2	m	-0/+10%	41	
Width	EN 1848-2	m	-0/+10%	2.44	
BS 8485:2015 + A1:2019 and C748:2014 physical test results					
Puncture	BS EN ISO 12236:2006	N	MDV	2850	
Impact resistance method A hard surface	EN 12691	mm	MDV	750	
Impact resistance method B soft surface	EN 12691	mm	MDV	>2000	
Tensiles yield strength MD 1	ASTM D4885-01	kN/m	MDV	11.9	
Tensiles yield strength CD 1	ASTM D4885-01	kN/m	MDV	12.7	
Yield elongation MD 1	ASTM D4885-01	%	MDV	>500	
Yield elongation CD 1	ASTM D4885-01	%	MDV	>501	
Tear resistance - trouser method A - MD	BS ISO 34-1	kN/m	MDV	79.6	
Tear resistance - trouser method A - CD	BS ISO 34-1	kN/m	MDV	75.8	
Tear resistance - angle method B - MD	BS ISO 34-1	N	MDV	128.3	
Tear resistance - angle method B - CD	BS ISO 34-1	N	MDV	126.9	
1 - this is at yield and not break as the equipment used was not strong enough to break the membrane					
BS 8485:2015 + A1:2019 - methane testing					
Methane permeability unjointed	ISO 15105-1	ml/m ² /d/atm	MDV	3.2	
Methane permeability welded joint	ISO 15105-1	ml/m ² /d/atm	MDV	34.7	
In order to comply with C748, Visqueen has expressed the test result units by volume (ml) and weight (mg)					
C748:2014 - Permeation vapour tests - 100% concentration		Criteria	ml/m ² /d	mg/m ² /d	mg/m ² /hr
Benzene	ISO 15105-2	MDV	0.08	67.7	2.82
Toluene	ISO 15105-2	MDV	0.09	75.9	3.16
Ethyl benzene	ISO 15105-2	MDV	0.11	90.7	3.78
m,p xylene	ISO 15105-2	MDV	0.01	6.5	0.27
Hexane	ISO 15105-2	MDV	gas	2.5	0.1
Vinyl chloride	ISO 15105-2	MDV	0	6.2	0.26
Tetrachloroethene (PCE)	ISO 15105-2	MDV	0	3.1	0.13
Trichloroethene (TCE)	ISO 15105-2	MDV	solid	0.3	0.01
Naphthalene	ISO 15105-2	MDV	0.03	19.1	0.8
C748:2014 - Chemical immersion testing					
Pass is achieved if the aged membrane is within 25% of the fresh sample		weight %	Thickness %	Tensiles/elongation	
Benzene	EN 14414	Pass	Pass	Pass	
Toluene	EN 14414	Pass	Pass	Pass	
Ethyl benzene	EN 14414	Pass	Pass	Pass	
(m,p, and o) xylene	EN 14414	Pass	Pass	Pass	

Visqueen Ultimate VOC Blok

Property	Test method	Units	Criteria	Result	
Hexane	EN 14414	Pass	Pass	Pass	
Vinyl chloride	EN 14414	Pass	Pass	Pass	
Tetrachloroethene	EN 14414	Pass	Pass	Pass	
Trichloroethene	EN 14414	Pass	Pass	Pass	
Naphthalene	EN 14414	Pass	Pass	Pass	
Visqueen can issue individual test reports on request					
CE Marking to EN 13967 Type A					
Characteristic	Test method	Units	Criteria	Result	
Tensile strength - MD	EN 12311	N/mm2	MDV	23.6	
Tensile strength - CD	EN 12311	N/mm2	MDV	22.4	
Tensile elongation - MD	EN 12311	%	MDV	701	
Tensile elongation - CD	EN 12311	%	MDV	706	
Joint strength	EN 12317-2	N	MDV	598	
Watertightness 2kPa	EN 1928	-	Pass/Fail	Pass	
Resistance to impact	EN 12691	mm	MDV	750	
Durability watertightness after heat ageing	EN 1296	-	Pass/Fail	Pass	
Durability watertightness against chemicals	EN 1847	-	Pass/Fail	Pass	
Resistance to tearing (nail shank) CD	EN 12310-1	N	MDV	720	
Resistance to tearing (nail shank) MD	EN 12310-1	N	MDV	750	
Resistance to static loading	EN 12730	kg	>MLV	20	
Water vapour transmission - resistance	EN 1931	MNs/g	MDV	2142	
Water vapour transmission - permeability	EN 1931	g/m ² /d	MDV	0.063	
Radon permeability	SP Method 3873	m ² /s	MDV	<3x 10 ⁻¹²	
Carbon dioxide permeability	ISO 15105-1	ml/m ² /d/atm	<40	7	

Health and safety information

Refer to the Visqueen Ultimate VOC Blok material safety datasheet (MSDS).

Visqueen Ultimate VOC Blok

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

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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.

DRAWINGS

