



**Castledine
Environmental**

LAND CONTAMINATION SURVEYS

Phase 3 Remediation Strategy and Verification Plan

for

**4 No. Semi-Detached Dormer
Bungalows and 1 No. Detached Dormer
Bungalow with Associated Parking and
Amenity Space**

on the site of

**Bethel and Bethesda Residential Care
Home, Equity Road East, Earl Shilton,
Leicester LE9 7FY**

Date: September 2025

Status:

Final Report

Reference:

4113T P3 Cooper – Equity Road East, Earl Shilton

Date:

25/09/2025

Author:	Checked by:
TR	VH

CONTENTS

<u>1.0</u>	<u>QUALITY ASSURANCE</u>	<u>1</u>
<u>2.0</u>	<u>LIMITATIONS</u>	<u>1</u>
<u>3.0</u>	<u>INTRODUCTION</u>	<u>2</u>
<u>4.0</u>	<u>SCOPE</u>	<u>2</u>
<u>5.0</u>	<u>SITE DESCRIPTION</u>	<u>3</u>
<u>6.0</u>	<u>OVERVIEW OF FINDINGS AND RECOMMENDATIONS FROM PREVIOUS REPORTS</u>	<u>4</u>
	6.1.1 SUMMARY OF SOIL CONTAMINATION	4
	6.2 SUMMARY OF GROUND GAS & VAPOUR REGIME	4
<u>7.0</u>	<u>OVERVIEW OF REMEDIATION OPTIONS; GARDEN SOILS</u>	<u>5</u>
	7.1 OPTION A- REMOVAL OF POTENTIAL SOURCES	5
	7.2 OPTION B- CAPPING OF SOFT LANDSCAPING AREAS	5
	7.3 OPTION C- HARDSTANDING AREAS	8
	7.4 OPTION D- IN-SITU TREATMENT	8
<u>8.0</u>	<u>OPTIONS APPRAISAL; GARDEN SOILS.</u>	<u>8</u>
<u>9.0</u>	<u>NEW POTABLE WATER PIPING</u>	<u>9</u>
<u>10.0</u>	<u>WASTE REMOVAL AND WAC TESTING</u>	<u>10</u>
<u>11.0</u>	<u>OVERVIEW OF REMEDIATION OPTIONS; GAS & VAPOUR BARRIERS</u>	<u>10</u>
	11.1 FLOOR SLAB	10
	11.2 VENTILATION MEASURES	11
	11.3 GAS RESISTANT MEMBRANE	11
	11.4 GAS PROTECTION SCORE SUMMARY	13
	11.5 OTHER ELEMENTS	13
<u>12.0</u>	<u>VERIFICATION PLAN</u>	<u>14</u>
	12.1 VERIFICATION OF CORRECT DEPTH OF COVER LAYER	14
	12.1.1 SAMPLING OF IMPORTED SOILS	14
	12.1.2 PHOTOGRAPHIC EVIDENCE FOR VALIDATING THE DEPTH OF COVER	14
<u>13.0</u>	<u>VERIFICATION OF GAS PROTECTION MEASURES</u>	<u>15</u>
<u>14.0</u>	<u>WATCHING BRIEF</u>	<u>16</u>
<u>15.0</u>	<u>VERIFICATION REPORTING</u>	<u>17</u>
	15.1 CAPPING MATERIAL	17
	15.2 GAS PROTECTION	17
<u>16.0</u>	<u>REFERENCES</u>	<u>19</u>

16.1	LEGISLATION AND REGULATIONS	19
16.1.1	ACTS	19
16.1.2	PLANNING REGULATIONS	19
16.1.3	CONTAMINATED LAND REGULATIONS	19
16.2	STATUTORY GUIDANCE	19
16.2.1	CL:AIRE	20
16.3	BRITISH STANDARDS	20
16.4	NON-STATUTORY TECHNICAL GUIDANCE	20
16.4.1	ENVIRONMENT AGENCY	20
16.4.2	CIRIA PUBLICATIONS	20
<u>17.0</u>	<u>APPENDICES</u>	<u>21</u>

LIST OF APPENDICES

APPENDIX A	VENTILATION PIPE LAYOUT	22
APPENDIX B	INSTALLATION DETAIL FOR GROUND GAS MEMBRANE	23
APPENDIX C	DISCOVERY STRATEGY	24
APPENDIX D	VISQUEEN SPECIFICATIONS SHEETS	25

1.0 QUALITY ASSURANCE

Castledine Environmental confirm that all reasonable efforts have been made to ensure that the information outlined within this report is accurate.

Castledine Environmental would further confirm that due care, attention and technical skill were used in the creation of this report.

For and on behalf of Castledine Environmental.

Kevin Castledine

(Director)

2.0 LIMITATIONS

The conclusions and recommendations made in this report are limited to those based on the findings of the investigation. Where comments are made based on information obtained from third parties, Castledine Environmental assumes that all third-party information is true and correct. No independent action has been undertaken to validate the findings of third parties. The assessments and interpretation have been made in line with legislation and guidelines in force at the time of writing, representing best practice at the time.

This survey has not included asbestos within existing structures, invasive plant species, geotechnical considerations or any elements unconnected with potential ground contamination at the site. If required, such surveys should be undertaken by suitably accredited organisations.

There may be other conditions prevailing at the site which have not been disclosed by this investigation and which have not been taken into account by this report. Responsibility cannot be accepted for conditions not revealed by the investigation.

3.0 INTRODUCTION

Castledine Environmental have been appointed by Cooper Residential Homes Ltd to undertake a Phase 3 remediation Strategy and Verification Plan at the Bethel and Bethesda Residential Care Home, Equity Road East, Earl Shilton, Leicester LE9 7FY.

The proposed development is for residential properties with private gardens and public open space.

4.0 SCOPE

Castledine Environmental have prepared this report for the sole use and reliance of Cooper Residential Ltd and its appointees for the purpose of ensuring compliance with:

- Paragraph(s) 174, 179, 183 & 184 of the National Planning Policy Framework 2021
- Part C1 of the building regulations.
- Support of Planning Application No: 22/00370/FUL

This report may not be used or relied upon by any unauthorised third party, or for any other proposed use than that specified above, without the explicit written agreement of Castledine Environmental.

The report consists of a Remediation Strategy and Verification Plan in accordance with

- BS10175:2011+A2:2017, Investigation of potentially contaminated sites. Code of practice
- BS 8485:2015+A1:2019 Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings and
- CLR11 “Model Procedures for the Management of Land Contamination”.
- LCRM “Land Contamination Risk Management”.

The objectives of the report are:-

- Summarise the existing information relating to the soil contamination and the ground gas regime within the area of the site.
- Consider remedial options based on practicality and effectiveness on the site.
- Set out the remediation measures and validation processes to be followed on site to ensure the site development does not pose a risk to human health.

5.0 SITE DESCRIPTION

The site is located in Earl Shilton, Leicester at National Grid Reference: 446481,297649 and is approximately 0.19ha in area.

The site is irregular in shape and is orientated north to south. The site is located in a predominantly residential area and is directly bounded by dwellings and their associated garden spaces to the west, north and east with an associated residential care home directly south of site.

The site interior comprises a redundant and disused access route, small car-parking area and an expanse of recently cleared ground. Access to site was provided via the care home access route, leading north off Equity Road East before terminating at the car-park on site. The secondary access, currently disused and overgrown, extends west from the car-parking area to the nearby Station Road. The car-parking area was seen to be formed by gravelled hardstanding. The remainder of site then comprises a vacant plot of land which had recently been cleared of overgrown vegetation. The ground conditions underfoot largely comprised sands and gravels with anthropogenic inclusions such as brick, plastics and some scattered wastes and debris (i.e. domestic wastes such as food wrapping and containers).

Topographically, the main site area was hummocky with the car-parking area level; whilst the surrounding areas dropped off from the north and north west to the south and south east.

6.0 OVERVIEW OF FINDINGS AND RECOMMENDATIONS FROM PREVIOUS REPORTS

The previous report (Phase 1 Geo-Environmental Assessment Produced in May 2025 and referenced: 3975D) should be referred to and read in conjunction with this report. Below is a summary.

6.1.1 SUMMARY OF SOIL CONTAMINATION

The desk study found that the site had historically been a cinema circa 1914, after which circa 1964 the northern part of the site became a works with car parking and lock up garages. By 1969 the northern works were a motor body works, and the cinema had become a works also. By 1989 all site structures had been demolished. In the wider site area the site was in the town of Earl Shilton, with gas works, kilns, depots, factories, engineering works, lock up garages and a council yard within 250m of the site boundary. Immediately adjacent to the site were bungalows and later the care home.

Identified possible sources of contamination were agricultural site uses, former site structures, industrial site uses, garage units and made ground. Risks to receptors in the site soils were estimated to be moderate.

6.2 SUMMARY OF GROUND GAS & VAPOUR REGIME

Potential sources of ground gas generation include a proximate former gas works with at least three gasometers (pre circa.1916) located directly south and south west of site (within 20-50m). Backfill for this structure could present a ground gas hazard to site though it was noted that approximately 109 years of decay will have occurred and any such deposits will be past their gas generational peak.

The bedrock deposits (Edwalton Member) underlying site are predominantly low to very low in permeability. Superficial deposits (Wolston Sands and Gravels) are likely highly permeable and would encourage degassing prior to entry to site structures. A moderate to low risk from ground gas was estimated to apply for site structures.

Possible sources of hydrocarbons and vapour have been identified on the site, and so a moderate to low risk from hydrocarbon vapours was estimated to apply for site structures.

The site has been given a tentative Characteristic Scenario (CS) 2 classification. Installation of gas protection measures to this standard are considered sufficient to reduce the risk to receptors.

The proposed development comprises private residential properties and so represents Type A buildings, as per Table 3 of BS8485:2015+A1:2019.

7.0 OVERVIEW OF REMEDIATION OPTIONS; GARDEN SOILS

7.1 OPTION A- REMOVAL OF POTENTIAL SOURCES

To protect receptors from the potential shallow contamination identified it may be possible to remove the site soils to a landfill. These are expected to be made ground and former structure foundations. It is not known the depth to which the made ground soils could extend.

Excavated soils can either be stockpiled for disposal or placed away from receptors e.g. below building footprints (Section 7.3).

Stockpiles should be placed on impermeable membrane / substrate and covered to prevent cross contamination with other site soils.

For disposal of waste soils, licensed and reputable waste transfer companies should be used. WAC tests or copies of the Phase 2 site investigation report may be required.

7.2 OPTION B- CAPPING OF SOFT LANDSCAPING AREAS

A cover blanket of certified clean soils can be used to cover contaminated soils and separate the pathway between them (the source) and the receptors at the surface.

Guidance found in Section A.3 of BS3882:2015: '*Specification for Topsoil*' states that the minimum rooting depth for grass, shrubs and trees should be at least 450mm, 600mm or 900mm, respectively; however, it is generally recommended that a *minimum* of 600mm of certified clean,

imported materials is emplaced in areas of soft-landscaping. This is based on the principle of 'two spade depths' which represents a rule of thumb for maximum depths which would credibly be reached during gardening or planting crops. Where made ground soils are present beneath the cover blanket, a high-visibility, woven geotextile membrane or 100mm 'hard break' layer of stone can be used to provide separation between imported material and residual soils, along with a warning layer to future excavation.

Prior to the placement of imported material, representative samples would be taken by a suitable qualified and experienced land contamination professional, in line with YALPAG best practices, and sent to a UKAS accredited laboratory for testing.

Material can be sourced from other developments and commercial companies. Dependent on the source of the material it can be classified as either from a 'Greenfield/Manufactured' or 'Brownfield/Screened' source.

Broadly speaking material can be classified as follows:

- Greenfield – where the source can be demonstrated to not have been developed and that no past contaminative uses have occurred at the site.
- Manufactured – where the source is a commercial company who manufacture material by mixing or blending mineral soils (subsoil or sand) with an organic amendment (compost).
- Brownfield – where the source is a donor site that has previously been developed.
- Screened – material from a company who deal with skip/demolition waste which is screened for unsuitable material i.e. bricks, wood, plastic etc.

Brownfield and screened material are more likely to be of a lesser quality and will require more robust testing to prove their suitability. Therefore Greenfield or Manufactured material should be used. Imported soil must not contain anthropogenic materials such as plastics, metals, asbestos, glass, tarmac, demolition rubble etc.

Any supplied testing results from a commercial company must be provably from the same material that is being imported and be no more than two months old. This should be provided to the relevant Local Authority prior to importation.

If certificates are not supplied then testing should be done before being brought to site, and the testing carried out by a UKAS accredited laboratory. If certificates are not supplied then testing should be done before being brought to site, the testing should be carried out by a UKAS accredited laboratory. Castledine Environmental can carry this out, should certification not be provided to the relevant Local Authority.

Each test must include as a minimum:

- Standard metals/metalloids (should include as a minimum As,Cd,Cr,CrVI,Cu,Hg,Ni,Pb,Se,Zn)
- PAH (16 USEPA speciation)
- Asbestos
- Total TPH
- pH
- Pesticide suite (where from agricultural sources)

Environmental samples of imported materials will be tested inline with current CLEA Soil Guideline Values and relevant Generic Acceptance Criteria (GAC) and SGV's.

Imported material should preferably not be stockpiled on site but placed in the intended area straight away so as to reduce chances of cross contamination. Where stockpiles must be made they should be situated on impermeable substrate / verified suitable-for-use soils and be covered to prevent accidental addition of unsuitable material.

Test results for the intended imported material must be submitted to the local authority and approved before being brought onto site.

All transfer notes and/or receipts for the soil should be retained.

The thickness of the soil placed will require evidence either via

photographs during its placement or by digging of post placement verification trial holes.

7.3 OPTION C- HARDSTANDING AREAS

Covering contaminated soils beneath hardstanding sufficient to prevent re exposure can sever the pathway between them (the source) and receptors.

Where contaminated soils are to be placed beneath hardstanding, a minimum of 200mm of crushed stone, brick (or similar) should also be used to provide an effective 'no-dig' layer beneath. This is to prevent future residents from lifting the hardstanding and coming into direct contact with residual site soils and/or prevent crop growth and the potential for direct and indirect ingestion of residual site soils.

7.4 OPTION D- IN-SITU TREATMENT

In some cases it is possible to remove the contaminated portions of a soil in-situ, allowing it to be used. Where contaminants are visible e.g. large fragments this can include hand-picking. Where contaminants are volatile e.g. naphthalene, this can include turning-over of soils to allow the volatile portion to vent to the atmosphere. Additional testing during and following the remedial works will be necessary.

This approach usually is the most labour intensive but requires the minimal amount of material being removed from site.

8.0 OPTIONS APPRAISAL; GARDEN SOILS.

Contaminated material is anticipated in all made ground soils and these should not remain in influencing distance of the surface in soft landscape areas.

It is not considered viable for in-situ treatment (Option D) due to the nature of the contaminants.

Much of the site is understood to be covered with drives, paths and building footprints. Receptors will be protected therefor as per Option C. Gardens

could also be covered with hard standing to further reduce risks to receptors, however this would require adjustment of the proposed development plan to remove soft landscaping and would detract from the presentation of the development.

Option A for the removal of contamination sources (made ground) is not considered viable alone, as the depth of contaminated soils is not known, and it is not considered plausible to reduce levels for the whole site.

Similarly Option B for addition of cover blankets would result in considerable elevation of the site levels.

Option A and B for removal of made ground site soils below completed ground levels and replacement with imported verified clean cover soils is therefore recommended as this will retain site levels whilst safeguarding site users from the possible contamination. Where natural strata is encountered before the full depth has been reached, the full depth will not need to be excavated. The nature of the natural strata will need to be confirmed by a suitably qualified geoenvironmental engineer however.

A 0.60m cover blanket is considered sufficient to prevent normal garden excavations (two spade depths) encountering made ground soils with a high visibility layer providing additional protection where contamination is present beneath this. A 1.00m cover blanket is considered sufficient to prevent uptake of contamination from tree roots, and should be adopted in places where new trees are proposed.

9.0 NEW POTABLE WATER PIPING

PAH compounds and TPH contamination can degrade and leach into plastic piping, thus impacting potable water supplies and end-users of the site. Provision should be made to contact the local water supplier regarding barrier piping specification, due to the identified contamination on site. It may also be feasible to lay new potable piping in clean, fresh excavations and be suspended in an inert pea-gravel matrix, preventing contact with residual site soils; however, the local water company should still be contacted regarding this.

10.0 WASTE REMOVAL AND WAC TESTING

Waste Assessment Criteria (WAC) and environmental testing may be required for the excavated site soils. These results should be provided to a suitable landfill for waste acceptance. This will allow swift and effective removal to a suitably accredited landfill, thus discharging the developers responsibilities in regard to waste removal duties.

Where WAC testing is requested these can be collected by a suitably qualified engineer.

11.0 OVERVIEW OF REMEDIATION OPTIONS; GAS & VAPOUR BARRIERS

Taking into account the gas regime and the building type, using Table 4 in BS8485:2015+A1:2019, the minimum Gas Protection Score required for the site is 3.5 points. This will also need to be vapour resistant due to former site uses.

A combination of the following protection measures should be used to achieve the Gas Protection Score, as determined in Section 4.3.1 of BS8485:2015+A1:2019:

- Structural barrier, or basement slab and wall if present;
- Ventilation measures; and
- Gas resistant membrane.

11.1 FLOOR SLAB

The residential properties within the south eastern area of the site are to have a beam and block floor slab. Based on Table 5 of BS8485:2015+A1:2019, this will achieve a Gas Protection Score of 0 points.

There should be no movement joints in the substructure masonry below the membrane level and all perpend, gaps and openings should be sealed to avoid gas migration.

Before laying the membrane, the beam-and-block floor should be thoroughly wetted and all joints grouted with a 4:1 sand:cement grout

brushed into all the joints. All projections that may puncture or damage the membrane must be removed. A layer of sacrificial polyethylene could be used.

11.2 VENTILATION MEASURES

The properties are to have a minimum 150mm clear ventilated sub floor void, with ventilation provided via telescopic air vents around the perimeter of each block at 2.00m centres.

The number of gas drains is to be confirmed but will meet or exceed the building regulations requirements of 1,500mm²/m run of wall (small to medium buildings) on at least two opposite sides. Should the building exceed 15m in length (larger buildings), this this should be increased to 2000mm²/m per run of wall, on at least two opposite sides.

The void should be well cross-ventilated (airbricks located on opposite walls) and if there are sleeper walls or other obstructions (change in levels etc) then there should be four or five times the area of the side vents provided in the obstruction. Appendix A shows a rough plan of the installation.

This should be sufficient to provide very good performance. Based on Table 6 of BS8485:2015+A1:2019, this will achieve a gas protection score of 2.5 points.

11.3 GAS RESISTANT MEMBRANE

A gas resistant membrane which meets all of the requirements of Table 7 of BS8485:2015+A1:2019 (reproduced as Table 1) will achieve a score of 2 Points.

TABLE 1. BS8485:2015 TABLE 7 GAS PROTECTION SCORE FOR THE GAS RESISTANT MEMBRANE REPRODUCED FROM BS8485:2015 + A1:2019

Protection element/system	Score	Comments
Gas resistant membrane meeting all of the following criteria: • Sufficiently impervious both in the sheet material AJ and in the sealing of sheets and sealing around sheet penetrations, to prevent any significant passage of methane and/or carbon dioxide through the membrane; • Sufficiently durable to remain serviceable for the anticipated life of the building and duration of gas emissions; • Sufficiently strong to withstand the installation process and following trades until covered (e.g. penetration from steel fibres in fibre reinforced concrete, penetration of reinforcement ties, tearing due to working above it, dropping tools, etc); and to withstand in-service stresses (e.g. settlement if placed below a floor slab); • Capable, after installation, of providing a complete barrier to the entry of the relevant gas; and • Verified in accordance with CIRIA C735	2	The performance of membranes is heavily dependent on the quality and design of the installation, resistance to damage after installation and integrity of joints. If a membrane is installed that does not meet all the criteria in column 1 then the score is zero.

Castledine Environmental have specified a membrane which is considered to be suitable for use as a gas and vapour barrier at the site:

- Visqueen Ultimate HC BLOK.

Suitable accessories are:

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

If an alternative product is proposed, then the manufacturer, membrane name and specification sheet should be forwarded to Castledine Environmental for approval prior to installation. Specification for gas membrane are included in Appendix D.

The membrane shall be extended across cavities and sealed around joints/service entries. Joints can be heat welded or taped with double sided butyl joint tape. Joints are to be overlapped by min 100mm and if joint tape is being used then it must be applied using a silicone roller to

remove trapped air. Visqueen self-adhesive gas membrane or Visqueen top hats and preformed corners should be used for sealing around protuberances.

If lap tape is to be used then it should not be fitted until the double-sided jointing tape has been verified.

Appendix B includes a rough detail for the installation of a gas membrane.

11.4 GAS PROTECTION SCORE SUMMARY

By implementing the above measures, the Gas Protection Score would be:

TABLE 2. CALCULATION OF GAS PROTECTION SCORE

Protection Measures	Score
Precast suspended beam and block floor	0
Ventilation measures	2.5
Gas resistant membrane	2
TOTAL	4.5

11.5 OTHER ELEMENTS

The gas membrane is to be installed when the construction is at slab level and then the insulation and screed placed upon it (after inspection). This will protect the membrane from on-going site activities.

The cavity should be filled to a level where it will support the membrane across the cavity. Any exposed sections across the cavity wall will be protected using sacrificial sheeting or DPM while any cavity work is undertaken.

Ground Gas Membrane is degraded by light and therefore if it is to be left exposed for two weeks or more it should be protected by covering with opaque material such as black plastic. Centre fold membranes must not be used.

12.0 VERIFICATION PLAN**12.1 VERIFICATION OF CORRECT DEPTH OF COVER LAYER**

- **DEPTH TESTING IN SITU**

Small trial pit excavated to allow measurement of its depth by tape measure or measuring staff. This would normally be one pit per garden area. Photograph each test pit showing depth of cap.

12.1.1 SAMPLING OF IMPORTED SOILS

- As per section 7.2, soils should be demonstrated to be suitable for use by laboratory testing.
- Laboratory test results should be provided to the consultant responsible for validation prior to import to prevent placement of unsuitable material.
- In some cases, such as where soil is imported without laboratory results, it may be necessary for on-site testing or in-situ testing of soils to be carried out.

12.1.2 PHOTOGRAPHIC EVIDENCE FOR VALIDATING THE DEPTH OF COVER

The following is guidance on photographs as additional evidence to support either of the above methods.

- Proof that the depth of inert cover has been installed.
- Proof there is a geotextile separator and visual warning membranes (if used) between the made ground and suitable for use soils.
- Proof of the method of placement and different layers if appropriate
- Proof of the completed project.
- Inclusion of geographic background features which will aid locating the photograph

13.0 VERIFICATION OF GAS PROTECTION MEASURES

In order to achieve the points claimed for the gas resistant membrane above, a validation procedure must be in place. The validation should be carried out by a suitably qualified and independent inspector and be undertaken in line with CIRIA C735. Membranes installed by a suitably qualified installer are more robust, require less verification (assuming that the work is to an acceptable standard) and are likely to be more cost effective. If the installation is to be carried out by a qualified and experienced installer then one visit should be carried out immediately following the fitting of the membrane. If the fitting is to be carried out by the builder / groundworker then an extra visit will be required when the site has been prepared for the membrane but before it is fitted.

On this basis, verification will be required as follows:

Gas regime/risk	Slab type	Installer experience	Suggested levels of verification and integrity testing
Low risk CS2 (*with venting)	Non reinforced All slabs	General builder/ groundworker / landfill operative (no relevant qualification)	Verifier (consultant or qualified and experienced installer) 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 and experienced installer (minimum one operative to hold qualification)	Verifier (consultant 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.

If during the initial or subsequent inspections or based on the installer supplied information the quality of the installation is not deemed to be to a sufficient standard, then additional visits and integrity testing may be required

14.0 WATCHING BRIEF

It remains possible that previously unexpected soil conditions may be encountered during the construction process. Examples may include oily pockets within the soil, potential for asbestos containing materials, black ashy materials, soils exhibiting strong odours, brightly coloured materials, and former demolition materials.

Should previously undiscovered contamination be encountered during the demolition/construction of the new buildings the following course of action should be adhered to:

1. The ground workers should report any suspected contamination immediately to the Client's site supervisor. The supervisor should contact the Client or their appointed agent who will in turn contact Castledine Environmental to request an engineer to visit the site to assess the extent of the 'contamination'.
2. Castledine Environmental shall make records of their inspection, and pass details of these to the Local Authority.
3. Where the conditions revealed differ from those previously anticipated, Castledine Environmental shall take samples as deemed appropriate to be dispatched for appropriate chemical testing.
4. Depending on the results of the testing either:
 - a. no further work will be required;
 - b. a further detailed risk assessment will be required; and/or
 - c. Localised specific remedial measures will be necessary.
Appraisal criteria will vary depending on the nature of the assessment.
5. The results of any such testing will be sent to the Local Authority Pollution Control Section, Local Authority development control section, and the appointed building inspector. If remediation is

required, the LA/Building inspector will be informed of the date and time of the proposed works.

6. Remediation will be undertaken in accordance with a method statement submitted for approval. The works shall be supervised where necessary by Castledine Environmental who shall provide a Verification Report for the Local Authorities.
7. A copy of the discovery strategy (Appendix C) should be lodged on site and provisions made to ensure that all workers are made aware of their responsibility to observe, report and act on any potentially suspicious or contaminated materials they may encounter.

15.0 VERIFICATION REPORTING

15.1 CAPPING MATERIAL

When the Capping layer has been completed and verified, a report should be produced for submission to the Local Authority. This should confirm that the works have been done and confirm that the site is now suitable for its intended use.

The report should contain:

- A summary of the remediation strategy and work undertaken.
- Copies of waste transfer note(s) and / or invoice(s) showing how much material has left site and its destination.
- A copy of the laboratory analysis results for imported material
- Copies of the transfer note(s) and / or invoice(s) for imported material showing the amount imported.
- Good quality photographs as indicated in section 12.1.1

15.2 GAS PROTECTION

Reporting of the verification activities will be completed following a site visit and verification of the installed gas protection measures. This should be carried out by a suitably qualified and *independent* inspector and the verification report will summarise the extent to which the remedial methods

have been achieved and supporting documentation to include site plans and membrane photographs.

16.0 REFERENCES**16.1 LEGISLATION AND REGULATIONS****16.1.1 ACTS**

- [1] Environmental Protection Act 1990, Part IIA: inserted by Environment Act 1995, Section 57. See Environment Act 1995 for text of Part IIA.

16.1.2 PLANNING REGULATIONS

- [2] The Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999 SI1999/No.293
- [3] The Town and Country Planning (Environmental Impact Assessment) (England and Wales) (Amendment) Regulations 2000 SI2000/No.2867

16.1.3 CONTAMINATED LAND REGULATIONS

- [4] The Contaminated Land (England) Regulations 2000. SI2000/No.227
- [5] The Contaminated Land (England) (Amendment) Regulations 2001 SI2001/No.663
- [6] The Contaminated Land (England) Regulations 2006 SI2006/No.1380

16.2 STATUTORY GUIDANCE

- [7] Department of Environment, Food and Rural Affairs. 2012. *Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance*. Department of Environment, Food and Rural Affairs
- [8] Communities and local Government, 2012: National Planning Policy Framework.

16.2.1 CL:AIRE

- [9] Card G, Wilson S, Mortimer S. 2012. *A Pragmatic Approach to Ground Gas Risk Assessment*. CL:AIRE Research Bulletin RB17. CL:AIRE, London, UK. ISSN 2047- 6450 (Online)

16.3 BRITISH STANDARDS

- [10] BS 5930:2015 Code of practice for site investigations
- [11] BS 10175:2011+A2:2017 Investigation of potentially contaminated sites - Code of practice
- [12] BS 8485:2015 +A1:2019 - Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings
- [13] BS 8576:2013 Guidance on investigations for ground gas. Permanent gases and Volatile Organic Compounds (VOCs)

16.4 NON-STATUTORY TECHNICAL GUIDANCE**16.4.1 ENVIRONMENT AGENCY**

- [14] Cassella Stranger, 2002. Model Procedures for the Management of Contaminated Land, Contaminated Land Report (CLR) 11, Department for Environment, Food, and Rural Affairs.

16.4.2 CIRIA PUBLICATIONS

- [15] Wilson, S., Oliver, S., Mallett, H., Hutchings, H., and Card, G.. 2007, *C 665 Assessing risks posed by hazardous ground gases to buildings* London: Construction Industry Research and Information Association
- [16] Mallett, H., Cox, L., Wilson, S. and ,Corban M... 2014, *C 735 Good practice on the testing and verification of protection systems for*

buildings against hazardous ground gases London: Construction Industry Research and Information Association

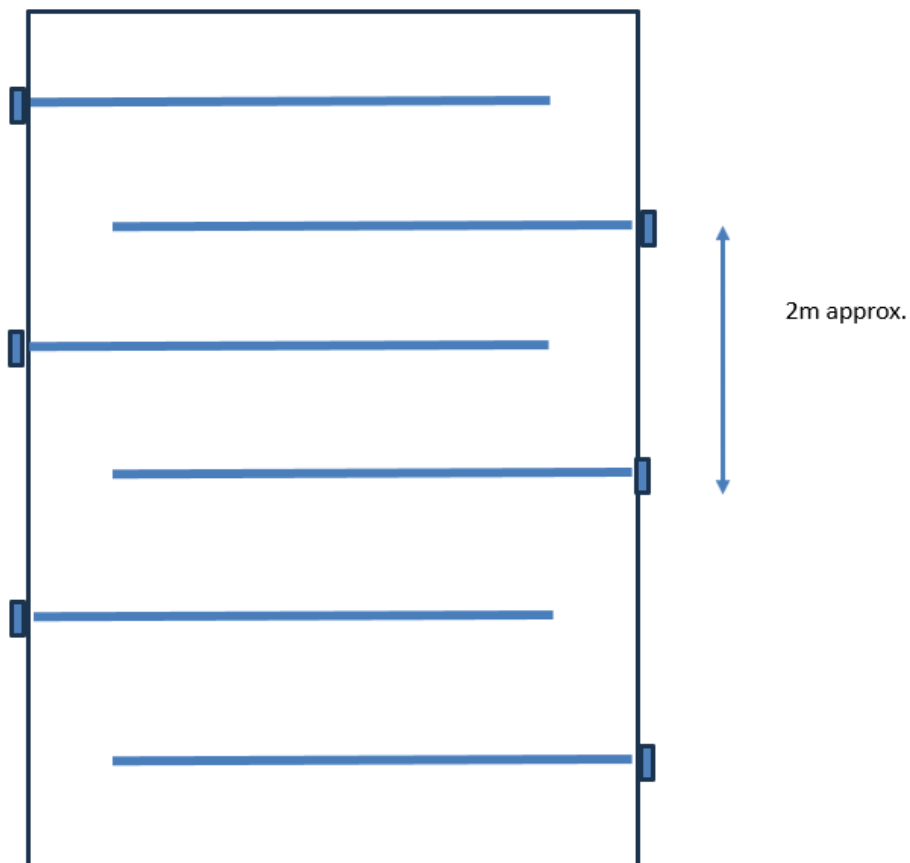
- [17] Wilson, S., Sopp, G., Mallett, H., Happold, B., Card, C., CBCard & Partners...2020, CIRIA C795 *Retrofitting hazardous ground protection measures in existing or refurbished buildings*. London: Construction Industry Research and Information Association

17.0 APPENDICES

APPENDIX A

VENTILATION PIPE LAYOUT

Indicative ventilation pipe layout



Vent (MUST be sealed to perforated pipe)



Perforated pipe (50-60mm Dia)

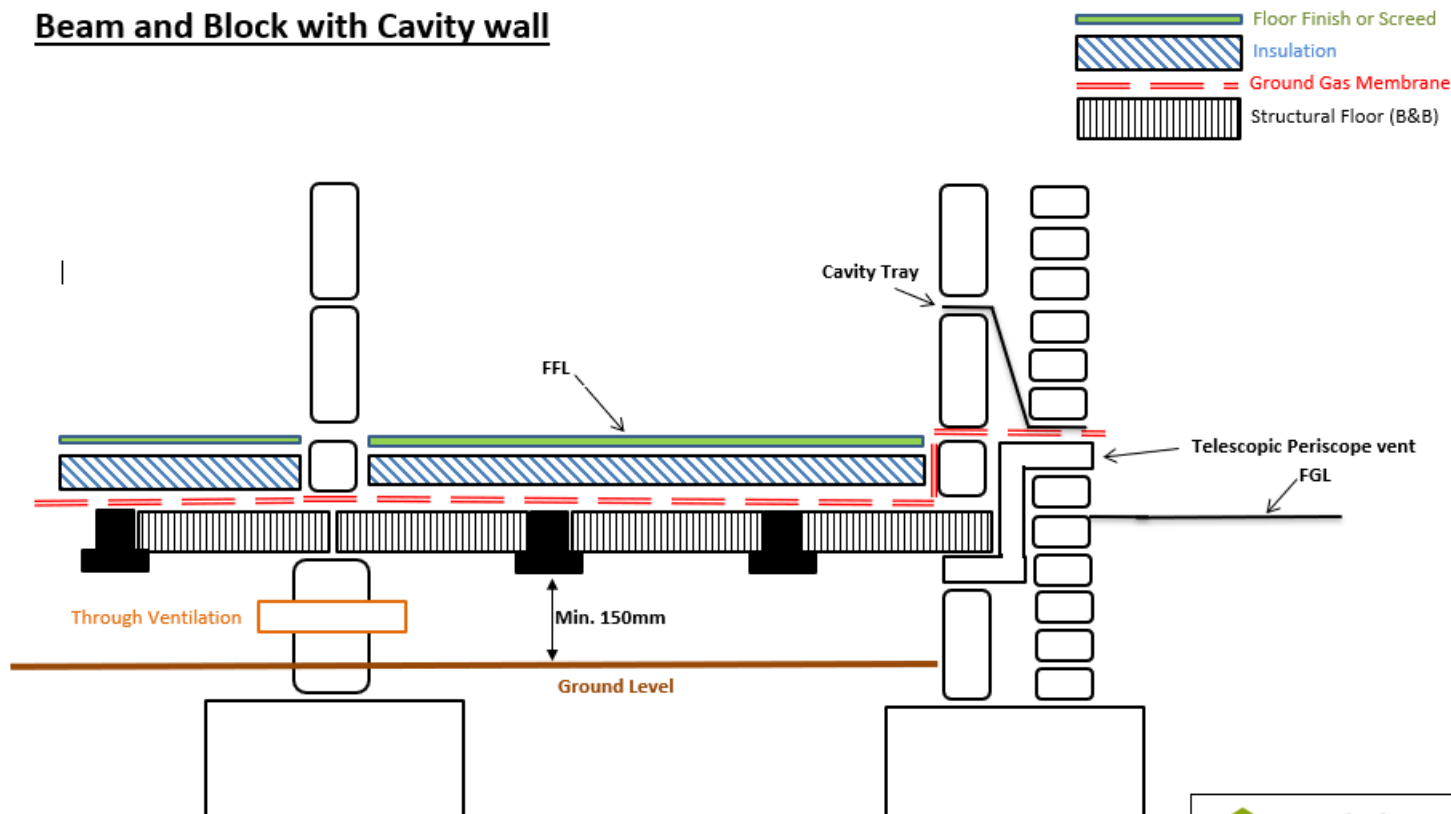
**CASTLEDINE
ENVIRONMENTAL**

Drawing not to scale

APPENDIX B

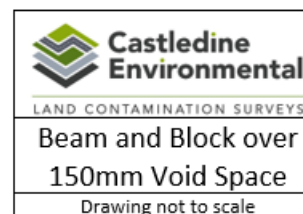
INSTALLATION DETAIL FOR GROUND GAS MEMBRANE

Beam and Block with Cavity wall



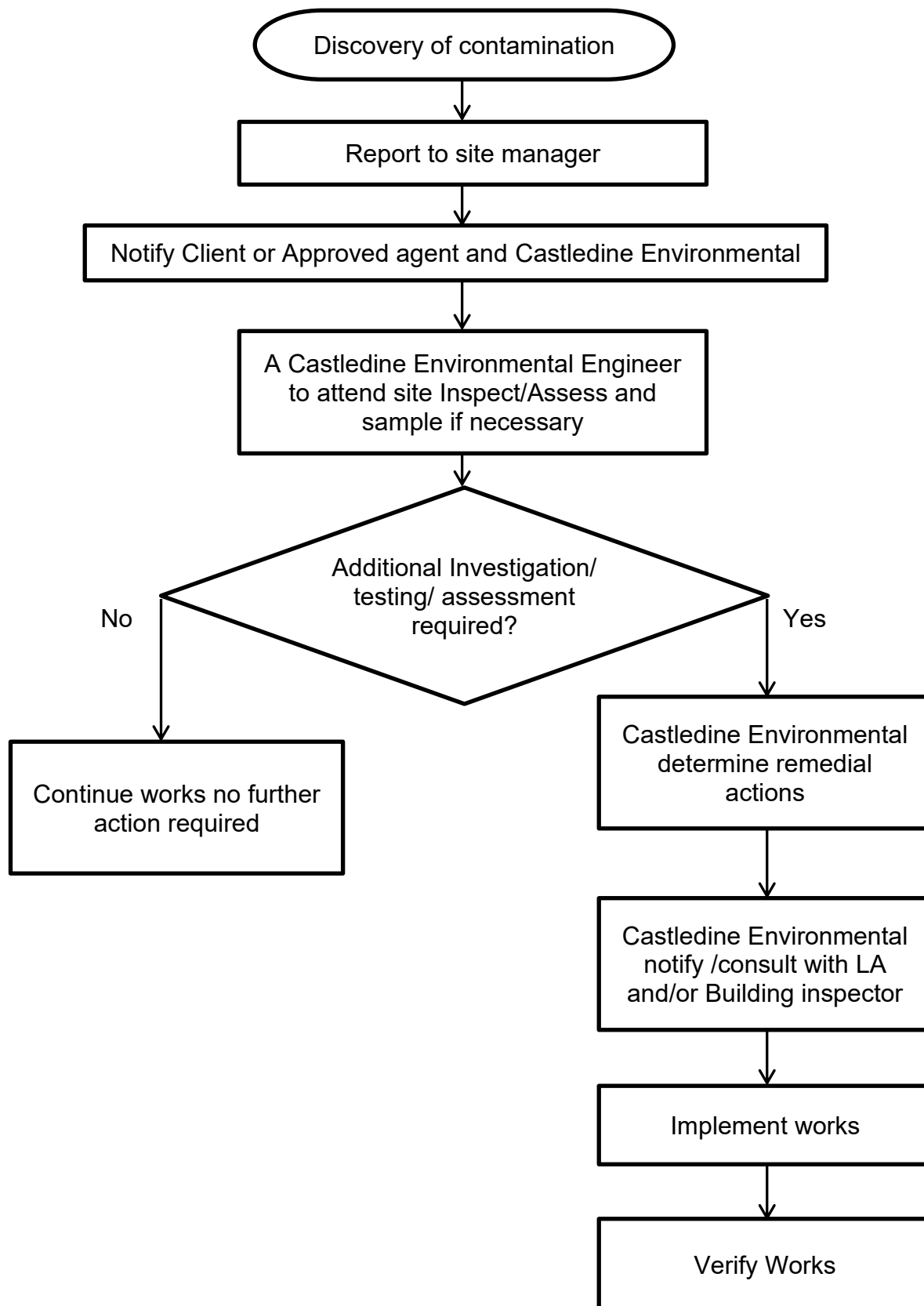
All structural detail to be confirmed by Architect

Note: All DPC / Membranes through masonry bed joints are required to be bedded both above and below with mortar



APPENDIX C

DISCOVERY STRATEGY



APPENDIX D

VISQUEEN SPECIFICATIONS SHEETS

Technical Datasheet - Product Overview



Technical support: +44 (0) 333 202 6800

Date Published: 21/07/2023

Visqueen Ultimate HC BLOK

Features and benefits

- Agreement certified - third party accreditation
- Complies with NHBC Foundation's NF94 guidance for use in Type A and Type B membrane locations
- Complies with CIRIA C748:2014 - industry standard for volatile organic compounds (VOC) protection
- Complies with the methane gas transmission rate, mass per unit area and thickness requirements of 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 Ultimate HC Blok is a 0.5mm thick, chemically resistant co-extruded volatile organic compound barrier and gas barrier. It is coloured gold on the upper surface and white on the reverse. The product is supplied in single wound rolls (not folded), 2.44m x 41m.

Approvals and standards

- Third party accreditation (BDA certificate BAF-18-051-P-A-UK)
- Complies with NHBC Foundation's NF94 guidance for use in Type A and Type B membrane locations
- Complies with CIRIA C748:2014
- Complies with the methane gas transmission rate, mass per unit area and thickness 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 211:2023
- CE Mark EN 13967:2012
- Quality Management System ISO 9001:2015
- Occupational Health and Safety System ISO 45001:2018
- Environmental Management System ISO 14001:2015

Usage

Visqueen Ultimate HC Blok is suitable for use in all types of buildings to prevent the ingress of harmful levels of volatile organic compounds (VOCs), methane, carbon dioxide and radon. The barrier can be positioned above or below a concrete ground floor slab or above a precast suspended segmental ground floor system, e.g. beam and block floor.

The barrier also acts as a damp proof membrane.

Radon, carbon dioxide, methane, and VOC protection – NHBC NF94 guidance:

Visqueen Ultimate HC Blok when installed with either taped or welded joints (welded only for VOC protection) complies with NHBC Foundation's NF94 publication, Hazardous ground gas - an essential guide for housebuilders, in Type A membrane locations in precast suspended segmental subfloors and reinforced cast in situ concrete floor slabs (ground bearing, suspended or raft).

Visqueen Ultimate HC Blok also complies with this guidance when installed with welded joints in Type B membrane locations in reinforced cast in situ concrete floor slabs (ground bearing, suspended or raft). For site or zone characteristic gas situations of CS4 and above, contact Visqueen Technical Services.

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

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

Find your local stockist



Heanor Gate Road, Heanor, Derbyshire, DE75 7RG
+44 (0) 333 202 6800 | enquiries@visqueen.com | www.visqueen.com



Technical support: +44 (0) 333 202 6800

Date Published: 21/07/2023

Visqueen Ultimate HC BLOK

Storage and handling

Visqueen Ultimate HC 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 HC Blok should be installed on a smooth continuous surface free from irregularities such as voids or protrusions e.g. grouted beam and block floor, 50mm thick sand blinding, or smooth concrete blinding.

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

Installation

Visqueen Ultimate HC Blok should be loose laid on the substrate with the gold 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 Ultimate Double Sided Jointing Tape and sealed with Visqueen GR Lap Tape. Alternatively lap joints can be heat welded to achieve an effective seal. The overlap in the barrier is typically 100mm and when hand welding, a 35mm weld is normally achieved. When hand welding, a roller must be used.

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. Alternatively VisqueenPro Detailing Strip can be used to seal service entry points. The upstand should be secured with a 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 VisqueenPro 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 VisqueenPro Detailing Strip and lapped at least 150mm beyond the extents of the puncture.

Long periods of exposure to ultraviolet light will reduce the effectiveness of the membrane. The membrane should be covered by a protective layer immediately after installation to prevent damage from following trades, ultraviolet light, etc. 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 Ultimate HC 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 may be required

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

For suspended beam and block floor detailing see HC-01

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

For internal and external corners Visqueen Ultimate Preformed Corner Units are available see PFU-553

To seal around steel columns use VisqueenPro Detailing Strip see HC-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.

Technical Datasheet - Test Data



Visqueen Ultimate HC BLOK

Technical support: +44 (0) 333 202 6800

Date Published: 21/07/2023

Property	Test method	Units	Criteria	Result	
Colour				Gold/white	
Weight		kg		49	
Length	EN 1848-2	m	-0/+10%	41	
Width	EN 1848-2	m	-0/+10%	2.44	
Thickness	EN 1849-2	mm	+/-10%	0.5	
BS 8485 and C748 physical test results					
Puncture	BS EN ISO 12236:2006	N	MDV	1640	
Impact resistance Method A hard surface	EN 12691	mm	MDV	200	
Impact resistance Method B soft surface	EN 12691	mm	MDV	1250	
Tensiles yield strength MD 1	ASTM D4885-01	kN/m	MDV	5.1	
Tensiles yield strength CD 1	ASTM D4885-01	kN/m	MDV	4.91	
Yield elongation MD 1	ASTM D4885-01	%	MDV	76	
Yield elongation CD 1	ASTM D4885-01	%	MDV	62	
Tear resistance - trouser method A - MD	BS ISO 34-1	kN/m	MDV	60.2	
Tear resistance - trouser method A - CD	BS ISO 34-1	kN/m	MDV	66.1	
Tear resistance - angle method B - MD	BS ISO 34-1	N	MDV	48.7	
Tear resistance - angle method B - CD	BS ISO 34-1	N	MDV	49.6	
1 - this is at yield and not break as the equipment used was not strong enough to break the membrane					
BS 8485 - Methane testing					
Methane gas transmission rate (unjointed)	ISO 15105-1	ml/m ² /day/atm	<40	1.3	
Methane gas transmission rate (welded joint)	ISO 15105-1	ml/m ² /day/atm	<40	24	
Carbon dioxide gas transmission rate	ISO 15105-1	ml/m ² /day/atm	<40	8.3	
C748:2014 - Permeation vapour tests - 100% concentration					
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
C748:2014 - Chemical immersion testing					
		weight %	Thickness %	Tensiles/elongation	
Pass is achieved if the aged membrane is within 25% of the fresh sample					
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	
Hexane	EN 14414	Pass	Pass	Pass	



Heanor Gate Road, Heanor, Derbyshire, DE75 7RG

+44 (0) 333 202 6800 | enquiries@visqueen.com | www.visqueen.com



Technical support: +44 (0) 333 202 6800

Date Published: 21/07/2023

Visqueen Ultimate HC BLOK

Property	Test method	Units	Criteria	Result	
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	
CE Marking to EN13967 Type A					
Characteristic	Test method	Units	Criteria	Result	
Tensile strength - MD	EN 12311	N/mm ²	MDV	32.8	
Tensile strength - CD	EN 12311	N/mm ²	MDV	33.1	
Tensile elongation - MD	EN 12311	%	MDV	699	
Tensile elongation - CD	EN 12311	%	MDV	723	
Joint strength	EN 12317-2	N	MDV	265	
Watertightness 2kPa	EN 1928	-	Pass/Fail	Pass	
Resistance to impact	EN 12691	mm	>MLV	200	
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	245	
Resistance to tearing (nail shank) MD	EN 12310-1	N	MDV	270	
Water vapour transmission - resistance	EN 1931	MNs/g	MDV	1034	
Water vapour transmission - permeability	EN 1931	g/m ² /d	MDV	0.13	
Radon permeability	Sp Method 3873	m ² /s	MDV	<1.5 x 10 ⁻¹²	

Health and safety information

Refer to the Visqueen Ultimate HC Blok safety datasheet (SDS).



Technical support: +44 (0) 333 202 6800

Date Published: 21/07/2023

Visqueen Ultimate HC 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

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.