BEK Geo-Environmental Consulting
No.2 Landwick Court, Metcalf Drive, Altham Business Park,
Lancashire BB5 5GY

mbuckley@bekenviro.co.uk
bekenviro.co.uk
[redacted]

LAND AT CROW TREES FARM, CHATBURN

Remediation Method Statement

Prepared for:

Pringle Homes

Report Ref: BEK-23127-2 (Rev D)

May 2025

BEK Geo-Environmental Consulting
No.2 Landwick Court, Metcalf Drive, Altham Business Park, Lancashire BB5 5GY

mbuckley@bekenviro.co.uk
bekenviro.co.uk
[redacted]

GEO-ENVIRONMENTAL CONSULTING

Project Quality Assurance Information Sheet

Site	Land at Crow Trees Farm, Chatburn
Report Title	Remediation Method Statement
Report Status	Final
Report No	BEK-23127-2 (Rev D)
Date	May 2025
Prepared For	**PRINGLE HOMES** The Coach House Hollowforth Lane Woodplumpton Preston PR4 0BD
Prepared By	**BEK ENVIRO** No 2 Landwick Court Metcalf Drive Altham Business Park Lancashire BB5 5GY
Author(s)	**Adam Hope** BSc (Hons)
Checked	**James Mashiter** BSc (Hons) MSc
Authorised	**Michael Buckley** BSc (Hons) MSc MIEnvSci CEnv
Contact	mbuckley@bekenviro.co.uk www.bekenviro.co.uk Office: [redacted]

GEO-ENVIRONMENTAL CONSULTING

BEK Geo-Environmental Consulting
No.2 Landwick Court, Metcalf Drive, Altham Business Park,
Lancashire BB5 5GY

mbuckley@bekenviro.co.uk
bekenviro.co.uk
[redacted]

LAND AT CROW TREES FARM, CHATBURN

Remediation Method Statement

PROJECT NO: 23127

REPORT REF: BEK-23127-2 (Rev D)

DATE: May 2025

REVISION STATUS / HISTORY

Rev	Date	Issue / Comment	Prepared	Checked
A	02/08/24	Minor mods to site name	AH	MB
B	07/03/24	Incorporation of third party gas design for barn into report	JM	MB
C	10/03/24	Minor amendment to drawings	DE	MB
D	06/05/25	Confirmaiton Farmhouse Gas Designs to be included within the Listed Building Consent Design Statements for approval by the EHO	JM	MB

GENERAL REPORT LIMITATIONS

BEK Enviro Limited (BEK) has prepared this report for the sole use of the client, showing reasonable skill and care, for the intended purposes as stated in the agreement under which this work was completed. The report may not be relied upon by any other party without the express agreement of the client and BEK. No other warranty, expressed or implied, is made as to the professional advice included in this report.

Where any data supplied by the client or from other sources have been used, it has been assumed that the information is correct. No responsibility can be accepted by BEK for inaccuracies in the data supplied by any other party. The conclusions and recommendations in this report are based on the assumption that all relevant information has been supplied by those bodies from whom it was requested.

No part of this report may be copied or duplicated without the express permission of BEK and the party for whom it was prepared. Where field investigations have been carried out, these have been restricted to a level of detail required to achieve the stated objectives of the work.

Unless explicitly agreed otherwise, in writing, this report has been prepared under BEK's limited standard Terms and Conditions as included within our proposal to the Client.

The report needs to be considered in the light of the BEK proposal and associated limitations of scope. The report needs to be read in full and isolated sections cannot be used without full reference to other elements of the report and any previous works referenced within the report.

TABLE OF CONTENTS

1. INTRODUCTION

1.1 Appointment

1.1 BEK Enviro (BEK) has been commissioned by Pringle Homes to prepare a method statement for the remediation works required to support the proposed residential development at Crow Trees Farm, Chatburn, Lancashire (hereafter referred to as 'the site').

1.2 Project Overview

1.2.1 This report has been prepared to support a planning application for the construction of 37 No. residential dwellings, alongside the refurbishment of the Grade II listed farmhouse and conversion/extension of the existing dairy building.

1.2.2 The proposed site plan is shown on LMP Architects Drawing No 21/139/P01 Revision D, dated September 2022.

1.3 Limitations

1.3.1 This report has been prepared to provide a summary of the remediation works required and the methodology for the validation of these works. The validation is important to confirm that the required works have been carried out in accordance with the approved remediation scheme and there are no future risks to end users of the site or the environment.

1.3.2 The site has been subject to previous site investigation and contamination assessment by BEK (see Section 2 below). These reports provide the basis for the remediation works required.

1.3.3 This report has been prepared in accordance with our understanding of current best practice. However, new information or legislation, or changes to best practice may necessitate revision of the report after the date of its issue.

1.3.4 BEK has prepared this report for the sole use and reliance of Pringle Homes in accordance with our standard Conditions & Limitations. This report may not be used or relied upon by any unauthorised third party without the explicit written agreement from BEK.

2. PREVIOUS SITE INVESTIGATIONS

2.1 Previous Reports

2.1.1 The site has been subject to detailed contamination assessment to identify potential significant risks associated with contamination with respect to the redevelopment of the site for residential use. The assessment is detailed in the following reports:

- Betts Geo Environmental – 'Desk Study Report – Land at Crow Tree Brow, Chatburn, Clitheroe', Report Ref: 22CHE293/DS, dated April 2022
- BEK – 'Site Investigation & Ground Assessment – Land at Crow Trees Brow, Chatburn', Report Ref: BEK-23127-1 (Rev A), dated October 2023
- BEK – 'Land at Crow Trees Brow – BRE 365 Infiltration Testing', Letter Report Ref: BEK/23127/231127/PRL (Rev A), dated 27th November 2023
- BEK – 'Land at Crow Trees Farm – Ground Gas Risk Assessment', Letter Report Ref: BEK/23127/240802/PH (Rev A), dated 2nd August 2024

2.1.2 The above reports should be read in conjunction with this report. The Site Investigation and the Ground Gas Risk Assessment forms the basis for the remediation works required at the site.

2.2 BEK Summary

2.2.1 The site investigation carried out by BEK has been designed to provide indicative information for ground conditions across the site with respect to the quantitative assessment for the potential risks associated with contamination as identified in the Preliminary Risk Assessment.

2.2.2 The site investigation was undertaken by BEK in October 2023 and comprised a total of 17 exploratory locations including 6 window sample boreholes and 11 machine excavated trial pits.

2.2.3 Made ground was encountered at the surface of three exploratory locations to a maximum depth of 0.5 m. The made ground subtypes encountered are described below:

- Cobble Set
- Black/grey vary gravelly SAND with occasional brick
- Tarmacadam on to black/brown gravelly sand with rare broken brick fragments and occasional small cobbles

Superficial Strata

2.2.4 Topsoil generally described as 'black/brown silty clayey sand with rootlets' was encountered in all other locations varying in thickness from 0.2 m to 0.4 m.

2.2.5 Brown silty clayey sand was encountered beneath made ground/topsoil in all exploratory locations, whilst brown sandy gravelly clay was encountered in all locations with the exception of Trial Pit TP7.

2.2.6 A horizon of organic peat was encountered in Trial Pit TP5 between 0.9 m and 1 m.

2.2.7 Black/grey limestone was encountered at the base of Trial Pits TP1, TP2, TP7, TP8, TP9, TP10 and TP11 and Boreholes WS2, WS3, WS4, WS5 and WS6. Shale was encountered in Trial Pit TP5, whilst sandstone and limestone were encountered at the base of Trial Pit TP6.

Groundwater

2.2.8 Groundwater was not encountered during the site investigation works or during groundwater monitoring

Visual & Olfactory Evidence of Contamination

2.2.9 No visual/olfactory evidence of contamination was encountered during the site investigation works.

Contamination Assessment

2.2.10 The chemical test results were compared to relevant generic assessment criteria to identify potential contaminants of concern. Based on the contamination assessment herein and with respect to the redevelopment of the site for residential use with gardens, marginally elevated concentrations of PAH compounds (Benzo(a)pyrene, Benzo(b)fluoranthene & Dibenzo(ah)anthracene) were found to be present within three locations of made ground at the site. Details of the location and depth of the elevations can be seen in Table 1 below. No risks to flora were identified.

Location	Depth (m)	Elevated Contaminant(s)
TP1	0.25	Benzo(a)pyrene, Benzo(b)fluoranthene & Dibenzo(ah)anthracene
TP2	0.15	Dibenzo(ah)anthracene
WS2	1.5	Benzo(b)fluoranthene & Dibenzo(ah)anthracene

Table 1: *Summary of Contamination Assessment*

2.2.11 Potential risks to service pipes are considered to be low but advice should be sought from the water supply provider. Risks to concrete are noted to be low and a concrete classification of DS-1 AC-1 is considered to be suitable.

Ground Gas Risk Assessment

2.2.12 The ground gas risk assessment concluded that the site is classified as Characteristic Situation 2 (CS2) and gas mitigation measures in accordance with CS2 (which are also capable of mitigating radon ingress) should be installed at the site.

3. REMEDIATION STRATEGY

3.0.1 In order to remove potential risks to the development and to human health, specific remediation and mitigation measures are necessary.

3.1 Contamination

Made Ground

3.1.1 Marginally elevated concentrations of PAH compounds (Benzo(a)pyrene, Benzo(b)fluoranthene & Dibenzo(ah)anthracene) were found to be present within three locations of made ground at the site.

3.1.2 Further assessment of the chemical test results for the three made ground samples containing contaminant elevations (See Table 1) shows they are all either currently, or will be as part of the development, located beneath hardstanding and/or buildings as oppose to within garden/landscaped areas.

3.1.3 This hardstanding will act as a break layer between any contamination within the underlying shallow made ground present beneath hardstanding and the end user.

3.1.4 Moreover, no elevated contaminants of concern were noted within any of the topsoil samples taken from within the existing landscaped areas of the development; which have in any case have remained as gardens/landscaped areas since the earliest historical mapping and will remain as such as per the proposed development.

3.1.5 Considering the above, BEK do not consider mitigation measures to be necessary within the garden/landscaped areas of the development and the topsoil may remain in-situ as it has proven to be suitable for use within those areas.

3.1.6 A watching brief should be utilised during development in the north of the site to ensure that no made ground is present within any garden/landscaped areas. Should made ground be encountered within these areas it may be necessary to undertake additional testing.

3.2 Ground Gas Precautions

3.2.1 On the basis of the assessment of the potential risks from ground gas, mitigation measures which adhere to Characteristic Situation 2 of CIRIA C665 (and are also capable of mitigating radon ingress) will be required at the site.

3.2.2 The existing farmhouse and dairy building located in the north of the site are to be refurbished/converted as part of the development, meaning any gas mitigation measures will need to be retrofit as oppose to installed within the new builds.

3.2.3 The retrofitting of gas mitigation measures applies to the 'Conversion & Extension Area' as illustrated in Figure 1 below (except the annex and its associated double garage which will contain standard detail CS2 (and radon) measures comprising a sub-floor void and a gas membrane fitted by a suitably qualified contactor). The installation of measures during initial construction within the new builds applies to the 'Development Area' which encompasses the majority of the site.

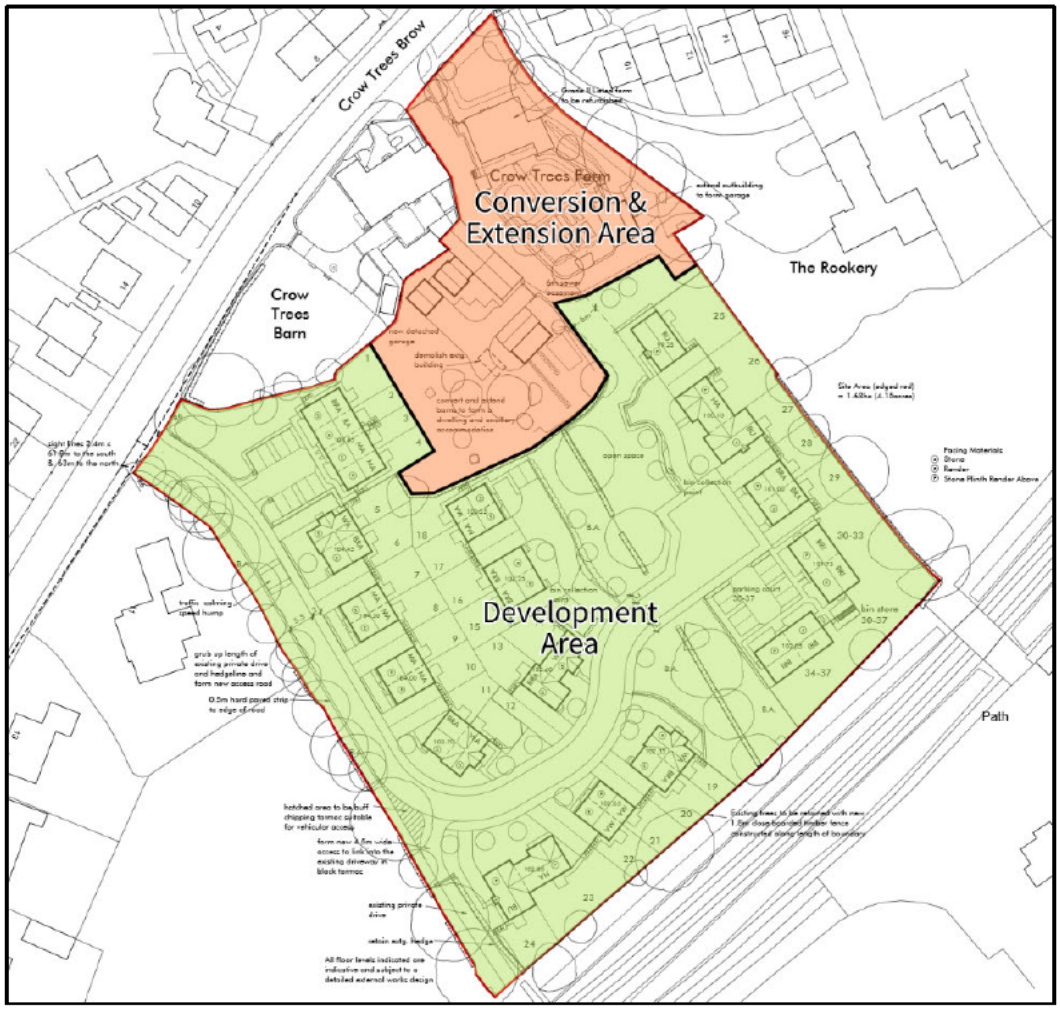


Figure 1: *Divisions of the Site for the Installation/validation of Gas Mitigation Measures*

3.2.4 The design of the gas mitigation measures for the conversion & extension area (See Figure 1) has been carried out by a third party and is included herein.

-**Annex Property** – BEK understand that the annex will comprise standard detail CS2 measures comprising a sub-floor void and a gas membrane within the property and its double garage fitted by a suitably qualified contactor in accordance with the standard details provided herein.

-Dairy Barn – The retrofit gas measures in the barn have been designed by Cordek. The ventilation calculations, standard details and design drawings incorporating the gas mitigation measures into the site-specific foundation design are provided in Appendix A. These will need to be submitted to the local authority for approval prior to their implementation within the property.

-Farmhouse – At present risks from methane, carbon dioxide and radon are present within the farmhouse. As such, CS2 gas mitigation measures (also capable of protecting against radon gas) will be required in the farmhouse.

3.2.5 BEK understand the farmhouse gas mitigation design (to be carried out by others) will be included within the Listed Building Consent Design Statements, as this falls under a specialist application. The designs will need to be submitted and approved by the local authority prior to commencement of works in the farmhouse area of the site.

3.2.6 Section 4 and 5 of this report herein include a Gas Verification Plan for the Annex property within the 'conversion and extension area' and the 'Development Area' of the site only (See Figure 1). This provides details of the specific mitigation measures required in this area to ensure the proposed gas measures comply with the points system presented within BS8485:2015+A1:2019 for the appropriate building type. The gas mitigation measures should be validated in accordance with CIRIA C735.

3.2.7 The farmhouse information will be provided by Pringle Homes and their appointed contractors at a later date as part of the Listed Building Consent Design Statements and will need to be approved by the regulator prior to the commencement of works on site.

3.3 Imported Material

3.3.1 There may be a requirement to import suitable topsoil/subsoil for use in the landscaped/garden areas of the development.

3.3.2 The suitability of the sub/topsoil and any other material imported to the site should be independently validated.

3.3.2 The details pertaining to the independent validation of material to be imported to the site are outlined within Section 7.3 of this report.

3.4 Off-Site Disposal

3.4.1 The chemical testing regime for off-site disposal may be different to the chemical testing required to assess the suitability of the soils for retention on site and the risks to human health. Therefore, additional assessment may be required to classify

the soils for off-site disposal with testing criteria to assess whether the soil is hazardous, non-hazardous or inert waste.

3.4.2 However, existing laboratory test certificate will help inform the process. Any additional testing should also be used in the classification of the waste soils for off-site disposal.

3.4.3 The receiving landfill may require additional specialist laboratory testing to further characterise the material proposed for disposal against Waste Acceptance Criteria (WAC). We would recommend early consultation between the Contractor and the receiving landfill to determine any specific laboratory testing requirements.

3.4.4 Individuals/companies removing soils from the site are bound by a Duty of Care and as such this should only be undertaken by an authorised person. All waste movements should be accompanied by a waste transfer note.

3.5 Dewatering

3.5.1 Groundwater was shown to be absent during site investigation works and groundwater monitoring.

3.5.2 Notwithstanding, if any water entering any of the excavations is visually or olfactory affected by contamination then consideration should be made for dewatering. Any impacted water should be carefully pumped from the excavation directly into a tanker for off-site disposal. Water will be pumped from the near surface of the water and (as much as practicable) away from the sides of the excavation to avoid pumping up soils.

3.5.3 All pumping activities will be carefully monitored by BEK to watch for drawing in contaminated water from elsewhere on the site. Pumping will continue until visual/olfactory evidence of contamination has reduced/gone or as is considered reasonably practicable.

3.6 Construction Workers

3.6.1 It is recommended that construction personnel involved with direct contact with the soils at the site use appropriate PPE equipment (i.e. boots, gloves and overalls).

3.6.2 In addition, hygiene facilities should be made available in accordance with general health and safety guidelines. The successful remediation/site works contractor should undertake a suitable Risk Assessment to confirm the appropriate level of PPE.

3.6.3 A copy of all reports relating to the site should be included in the site Health & Safety File and site workers should be made fully aware of the site's setting.

3.7 Concrete Mix Design

3.7.1 It is recommended that a concrete classification of sulphate class DS-1 and Aggressive Chemical Environment for Concrete (ACEC) class of AC-1 is suitable for the site.

3.7.2 Confirmation that the correct concrete mix has been used on site is outside the BEK validation remit.

3.8 Unforeseen Circumstances

3.8.1 Any areas of previously unidentified potentially contaminated soils encountered during site construction works must be brought to the attention of BEK, to ensure that the recommendations herein apply. Any potentially contaminated soils should be left in-situ and subjected to further assessment, to potentially include further chemical testing and risk assessment.

3.9 Utilities

3.9.1 Prior to redevelopment of the site, BEK recommends that a copy of this report and the previous reports relating to the site are supplied to utility companies, and that their recommendations relating to appropriate supply pipes are adhered to.

3.10 Re-use of Waste Soils on Site

3.10.1 The re-use of waste soils generated at the site should be covered through environmental permit exemptions (if applicable) and/or through the preparation of a Material Management Plan as part of compliance with the Definition of Waste: Code of Practice (DoW:CoP).

3.11 Communication

3.11.1 We would recommend that regular communication is maintained between BEK and the Site Manager throughout the development works.

3.12 Statutory Consultation

3.12.1 We would recommend that a copy of this Remediation Method Statement is issued to the local authority for review/comment and approval prior to the commencement of re-development works on site.

3.12.2 The insurer may also require written approval of the remediation proposals from the regulators in order to satisfy their Land Quality Conditions.

3.13 Pre-Start Meeting

3.13.1 It is recommended that a meeting is held between the relevant parties on site, prior to commencement of validation works.

3.14 Closure

3.14.1 Following satisfactory completion of remediation works, BEK will produce a Validation/Completion Report to demonstrate compliance with this Remediation Method Statement.

4. DESIGN OF GROUND GAS PROTECTION MEASURES

4.1 General

4.1.1 In accordance with Table 4 of BS8485 (2015) + A1 (2019), the proposed properties are assumed to represent **Type A** buildings. In order to protect against the CS2 ground gas risks identified, a gas protection score of **3.5 points** must be achieved.

4.1.2 A combination of two or more of the following protection measures should be used to achieve the Gas Protection Score:

- Structural barrier (floor slab)
- Ventilation measures
- Gas resistant membrane

Site Specific Assessment of Foundation Design - Gas Protection Score Assessment

4.1.3 The proposed construction elements to achieve the required points of 3.5 points are given below:

- Beam and block floor construction is to be utilised. This achieves **0 points.**
- A ground gas resistant membrane is recommended. This achieves **2 points.**
- A clear void passive venting layer with 'very good' performance is recommended. This achieves **2.5 points.**

4.2 Floor Slab

4.2.1 This floor type contains many construction joints and discontinuities and can be affected by cracking. As such, it offers little resistance to the passage of ground gas and has high permeability.

4.2.2 Based on Table 6 of BS8485:2015+A1:2019, this will achieve a gas protection score of 0 points.

4.3 Ventilation Measures

4.3.1 For the proposed development, it is intended to include a minimum 150 mm deep ventilated sub-floor void with ventilation provided via air vents around the perimeter of each property. The number of vents is to be confirmed but will meet or exceed the BS8485:2015+A1:2019 requirements of 1,500 mm^2/m run of wall on at least two opposite sides. This should be sufficient to provide very good performance.

4.3.2 Where there are multiple internal obstructions to air flow (caused by beams) there should be at least four (to five) times the area of the side vents provided to the internal obstruction.

4.3.3 Based on Table 6 of BS8485:2015+A1:2019, this will achieve gas protection score of 2.5 points.

4.4 Gas Resistant Membrane

4.4.1 A low permeability methane and carbon dioxide resistant membrane (also protective against ingress of radon) which meets all of the requirements of Table 7 of BS8485:2015+A1:2019 will achieve a score of 2 points. This membrane should:

- Be made from virgin polymer and have a methane transmission rate of less than 40.0ml/day/m2/atm (average);
- Be chemically resistant to degradation by other contaminants that may be present;
- Be sufficiently impervious, both in the sheet material 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;
- Be sufficiently durable to remain serviceable for the anticipated life of the building and duration of gas emissions;
- Be 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);
- Be capable, after installation, of providing a complete barrier to the entry of the relevant gas; and
- Be verified in accordance with CIRIA C735

4.4.2 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 above then the score is zero.

5. INSTALLATION OF GROUND GAS PROTECTION MEASURES

5.1 General Comments

5.1.1 In concurrence with the NHBC guidance 'Hazardous Ground Gas - an essential for housebuilders – April 2023', BEK recommends a welded solution be adopted for the sealing gas membranes at critical junctions including laps and joints.

5.2 Components of the Membrane System

5.2.1 The manufacturer of the membrane and its associated components has yet to be confirmed by the client. The installed membrane and its associated components will need to meet the requirements of BS8485:2015+A1:2019.

5.2.2 BEK recommends two membranes which are considered suitable for use as a gas barrier and these are:

- Visqueen Ultra Gas Barrier
- Juta GP1 (Juta)

5.2.3 All membrane installation must be undertaken to the manufacturer's specification and the membrane should be welded.

5.2.4 Installation accessories will also be necessary (the exact components will depend on the installation method and the exact design of the building). Components utilised to install the gas membrane system include but are not limited to:

- Jointing tape (double sided, gas resistant tape)
- Pre-formed top hats
- Pre-formed Corners and Stop Ends
- Jubilee clips
- Gas Resistant Self-Adhesive Membrane (and primers if this is sealed directly to masonry, metal or concrete)
- Gas Resistant Damp Proof Course (strongly preferred in areas where internal and external walls are to be constructed)
- Liquid Gas Membrane

5.2.5 All products utilised in the gas membrane system will need to be pre-approved by BEK. Any additional products utilised will need to be re-reviewed to confirm they meet the requirements of BS8485:2015+A1:2019.

5.3 Ventilation Measures

Sub-Floor Void

5.3.1 The beam and block system should incorporate a void depth of a minimum 150 mm free from debris and obstructions.

Air Bricks

5.3.2 The number of vents will meet or exceed the BS8485:2015+A1:2019 requirements of 1,500 mm²/m run of wall on at least two opposite sides. A typical air brick provides (6,000mm^2 vent area).

5.3.3 Regardless of ground gas protection requirements, the NHBC advise for protection against moisture is that void ventilation should be provided to whichever gives the greater opening area of either (i) 1500mm^2 per metre run of external wall or (ii) 500 mm^2 per m^2 of floor area. Therefore, minimum NHBC requirements are likely to be appropriately protective in terms of ground gases for low rise housing. It is outside the BEK remit to confirm whether the NHBC standards/building regulations are met with regards to protection against moisture.

5.3.4 BEK will validate that the number of vents will meet or exceed the BS8485:2015+A1:2019 requirements of 1,500 mm²/m run of wall on at least two opposite sides.

Internal Sleeper Walls

5.3.5 Where there are multiple internal obstructions to air flow caused by beams and sleeper walls, cross vents will need to be installed. These need to provide a minimum of 6,000 mm^2/m.

5.3.6 The simplest approach is to use short sections of 100 mm diameter PVC drainage pipe through the sleeper wall or construct it with gaps in the blockwork.

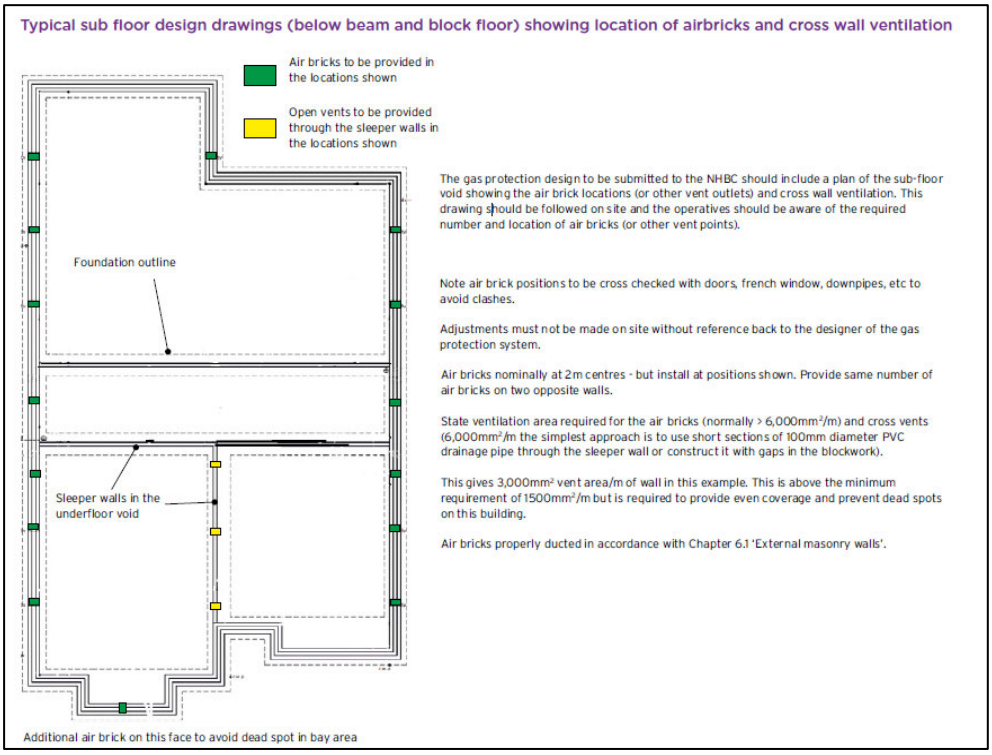


Figure 2: Example Drawing Showing Air Brick Locations

5.4 Ground Gas Membrane Installation - Outline Methodology

Preparation of the surface underlying the membrane

5.4.1 The surface underlying the membrane should have a smooth finish - free from voids, projections, and mortar deposits.

5.4.2 The gaps between the block and beams should be filled with a sand cement screed brushed into the joint. In many instances blocks are cut leaving gaps around pipe penetrations, these should be filled with expanding foam or sand and cement to ensure that the gas membrane is fully supported.

5.4.3 The beam and block floor should be prepared as per the manufacturer's specification (e.g. a sand blinding layer, protection fleece, or a smooth concrete float finish).

Laying of the Gas Membrane System

5.4.4 The membrane system shall be laid loosely extended across cavities and sealed around joints/service entries as per the manufacturers specification. In order to protect against the ingress of hydrocarbons, it is a requirement that the membrane is welded rather than taped.

5.4.5 Service penetrations shall be sealed with proprietary 'top hats' to the membrane and service pipe using propriety products in accordance with the

manufacturer's specification. Top hats should be sealed to the pipe and gas membrane with welding/self-adhesive gas membrane used to form a gas-tight seal..

5.4.6 Corners and non-standard service entries will be preferentially sealed utilising Gas Resistant Self-Adhesive Membrane. Corners and block ends can also be sealed with pre-formed units.

Protection of the Gas Membrane System

5.4.7 BEK recommends that the gas membrane is protected through placement of the insulation and/or fleece protection above the membrane within one working day of a passed inspection (as per the manufacturers specification).

Sealing of Internal Annulus around Service Pipe

5.4.8 In terms of the internal annulus of the duct holding each of the service pipes and conduits (electric cables and water pipes in some areas etc.) this will be filled with expanding foam and liquid applied gas membrane. The detail for this is provided in Figure 3.

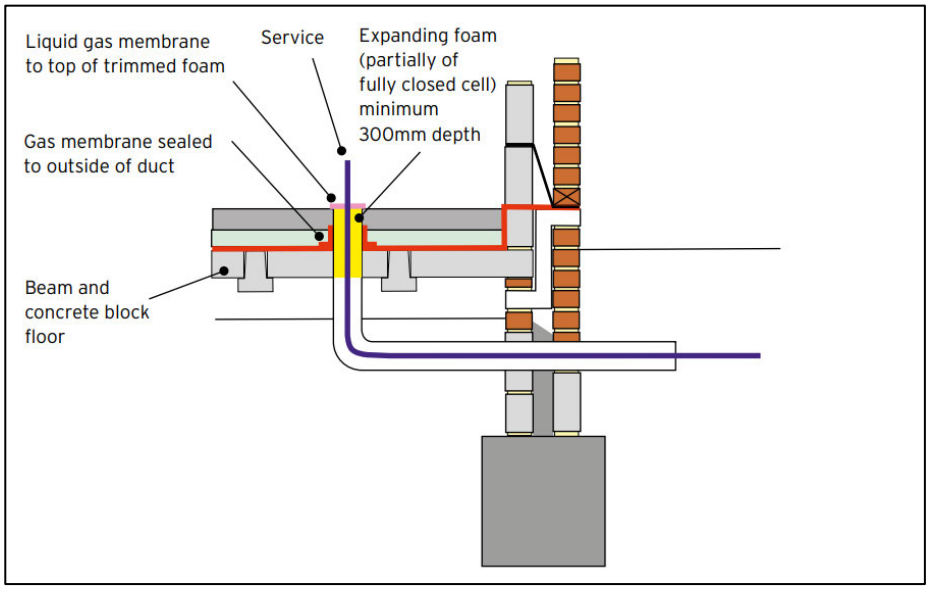


Figure 3: *Sealing of the Internal Annulus of the Service Duct (extracted from NHBC – an essential guide for house builders – April 2023)*

5.5 Installer of Ground Gas Measures

5.5.1 The exact construction company appointed to install the gas protection measures is unknown at the time of writing. The installers should be trained and experienced in the installation of ground gas resistant membranes.

5.5.2 BEK has recommended that in accordance with the NHBC 'Hazardous Ground Gas – an essential guide for housebuilders' the installation of the gas membrane system will need to be carried out by a specialist gas membrane installation company (specialist installer) with at least 50% of staff holding an NVQ level 2 (gas membrane installation) and/or TWI/CSWIP plastic welding accreditation with the remaining staff working towards one of those qualifications.

5.6 Verification

5.6.1 The installation of the membranes will be independently validated by an appointed environmental consultant from BEK. Michael Buckley (BSc (Hons) MSc MIEnSci CEnv), owner and Managing Director at BEK Enviro Ltd has over 25 years' experience in the verification of ground gas mitigation measures. Michael Buckley is responsible for the appointment/training of suitably qualified staff to verify gas measures and the ultimate sign off of all verified gas mitigation measures.

5.6.2 All staff involved in the verification of ground gas mitigation measures are degree qualified and a number of employees at have attended the 'Verification of Gas Protection Systems Course' delivered by CL:AIRE. In house training has been delivered to all BEK employees involved the verification of ground gas mitigation measures.

6. GAS MEASURES VALIDATION PLAN

6.1 Supervision of Works

6.1.1 The verification as described herein follows the recommendations set out in CIRIA C735 'Good practice on the testing and verification of protection systems for buildings against hazardous ground gases'. The works will be verified in accordance with CIRIA 735 (2014) by an experienced, suitably qualified verifier.

6.1.2 The installation of the gas protection measures (ventilation system and gas membrane installation) will be checked and verified by the Engineer at key stages during the works.

6.2 Key Verification Responsibilities & Hold Points

6.2.1 Verification lines of evidence need to be collated at a number of hold points. Such lines of evidence are required to ensure that the gas mitigation measures have been installed in accordance with the methodology presented in the Gas Verification Plan report herein.

6.2.2 However, it will not always be possible (or practicable) for BEK to be present for every stage of the remediation works in every plot and therefore some degree of verification will need to be undertaken by the developer. However, this should only be done following communication with BEK to ensure that appropriate validation records are maintained.

6.2.3 In all cases, it will be the responsibility of the developer to ensure that the verifier is contacted to collate verification evidence/in house verification evidence is collated at the below mentioned hold points:

Verification Hold Points	Evidence Requirement and Party Responsible for collation of such evidence
Verify depth of sub-floor void	Verification Consultant &/or Developer (Developer can only provide these records when BEK is confident that appropriate evidence has been collated) - Provide location referenced example photos
Spacing of air bricks, inspection of underside of membrane placement and sealing of the gas membrane across the entire building footprint	Verification Consultant - is to conduct a thorough visual inspection of 100% of the membrane area prior to it being overlain by insulation and a concrete screed poured to ensure all joint/penetrations are sealed appropriately. BEK is also to verify that the air bricks have been installed at the locations specified in the design drawings.
Placement of the insulation and/or fleece protection above the membrane.	Developer - is to ensure that the membrane is insulated within 1 working day of the inspection passing on a given plot. This should be considered for periods of site closures (ie the Christmas break).
Watch brief following inspection of the membrane and prior to concrete pour to ensure gas membrane is not punctured/damaged by follow on trades	Developer - is to ensure that follow on trades are aware of the presence and purpose of the gas membrane, and who they should contact if they believe their actions have had the potential to compromise it. A watch brief should be maintained by the developer to ensure that the membrane is not damaged by follow on trades. BEK should be contacted if the developer has reason to believe the measures have been compromised.
Sealing of service ducts (prior to occupation)	Developer - is to provide confirmation that the internal annulus of any open portion of any service duct annulus has been sealed in accordance with the design drawings. Plot specific location referenced photos to be collated for all seals and to be provided to the local authority on request
Ground level checks at airbricks (prior to occupation).	Developer - is to inspect the placement of airbricks with reference to finished ground levels after completion of landscaping works to ensure theses have not been obscured.

Table 2: *Summary of Key Verification Hold Points and Lines of Evidence Required at Each Hold Point.*

6.3 Visual Inspection & Integrity Testing

6.3.1 A **visual inspection** method is recommended to be carried out by BEK on every plot. This should be undertaken following laying of the beam and block floor and laying of gas membrane on top, but prior to laying of insulation and pouring of the screed.

6.3.2 All joints, pipe penetrations etc air lanced to ASTM D4437.

6.4 Verifier Checklist

6.4.1 The BEK verifier or other suitably qualified verifier should:

- Confirm that the correct membrane has been used, including sealing/jointing tape and preformed components e.g. top hats, corners, self-adhesive gas membrane.
- Confirm that the underside of the membrane has been installed and prepared as per the manufacturer's specification with the underside of the membrane being free from voids, projections, and mortar deposits.
- Inspect the general condition of the membrane for punctures, rips and tears.
- Check that joints and laps have been sealed in accordance with manufacturers specification.
- Check that the membrane has been installed correctly across cavities, including correct jointing in these areas.
- Check that top hats have been correctly installed around service entries, including jubilee clips around the pipe and correct sealing arrangements to the membrane/pipe infrastructure as per the manufacturer's specification.
- Check that vents have been installed around the perimeter of the building in sufficient number and in the correct locations, including inspecting the condition i.e., not blocked or otherwise restricted.
- Check the presence of a passive ventilation system (clear >150mm void), including measuring that this is of a sufficient depth and the void has not been filled or otherwise compromised.
- Check that internal sleeper walls are also vented to provide adequate flow-through within the void so that none of the walls are blocking off unvented sections within the void.

6.4.2 Any sections of the gas membrane displaying a flaw, failing a visual inspection or failing integrity testing (if required) should be repaired under the supervision of the verification consultant until rectifications are considered acceptable. The verification consultant should record the type and result of the repairs on the gas proforma (to be completed on a plot x plot basis).

6.4.3 If the verification consultant leaves the site without rectifications being made then the plot inspection will be failed subject to re-inspection at a later date.

6.4.4 Photographic evidence will be recorded during all inspections and a suitable record of the validation will be included within a validation report.

6.4.5 A gas measures proforma sheet will be completed detailing the inspection for each inspection visit. An example of the gas pro-forma to be used is presented in Appendix B.

7. SUPERVISION AND VALIDATION

7.1 Supervision of Works

7.1.1 The works will be supervised by BEK who will ensure the following verification procedures are adopted:

(i) Liaison with the appointed groundwork/remediation contractor

(ii) Inspection and supervision of the works

(iii) Collection of samples and co-ordination of laboratory testing

7.1.2 The remediation areas will be checked and verified by the Engineer at key stages during the works, including:

(i) Installation of the telescopic vents for the passive ventilation.

(ii) Following placement and sealing the proprietary gas membrane

7.1.3 For a sustainable approach it is recommended that the excavated soils are retained on site. However, this may not be achievable due to the requirements in meeting finished site levels.

7.2 Validation of the Works

7.2.1 Validation testing is required to ensure the remediation works have been undertaken in accordance with the methodology presented herein.

7.3 Imported Material

7.3.1 It may be necessary to import additional soil for use in the landscape/garden areas. If possible, all imported soils should be sourced locally.

7.3.2 The methodology to validate the quality of any imported material for use in the gardens will depend on source of those materials. Materials from a known source, where independent risk assessment has been carried out would require no further testing, provided it has been sampled on an appropriate density and has been proven fit for purpose in accordance with residential criteria.

7.3.3 To confirm the suitability of the sub/topsoil it will be necessary to recover representative samples for chemical testing and assessment. We initially recommend that this consists of a minimum of 3 samples, however the sampling frequency may be varied at the discretion of the Engineer depending on the nature and variability of the soil.

7.3.4 The methodology to validate the quality of any imported material for use in the gardens will depend on source of those materials. Materials from a known source, where independent risk assessment has been carried out would require no further testing, provided it has been sampled on an appropriate density and has been proven fit for purpose in accordance with residential criteria.

7.3.5 Without any validatory information, all potentially suitable sub/topsoil will be thoroughly assessed at source prior to importation onto the site. The Engineer will obtain samples from the identified sources, at a rate of between 3 and 5 samples per source depending upon the volume of material available.

7.3.6 It will also be necessary to carry out routine inspection and sampling during the importation process in order to confirm the material is consistent with the source testing and assessment.

7.3.7 The visual inspection shall ensure that the soil is visually acceptable for use and does not contain any deleterious material (i.e. glass, plastic, brick, concrete etc.).

7.3.8 Imported topsoil and subsoil being brought to the site should be tested for contamination to ensure that they are suitable for residential end use. Testing of imported soils can be undertaken upon import within a stockpile, or preferably upon placement within rear gardens areas. Testing will vary based on the source of the material.

7.3.9 All soils from greenfield sources will be checked to confirm the greenfield status and confirmation will be provided in the Validation Report (ie red line site boundary, grid reference and other checks).

7.3.10 If soils are not greenfield then sampling frequencies should be agreed with the Local Planning Authority (LPA) prior to undertaking the work.

7.3.11 Imported topsoil and subsoil will be tested in accordance with Table 3 below.

Type	Number of Samples	Testing Schedule	Assessment Criteria
	Please note that these guidelines apply to a typical residential development, and relaxation of the guidelines or more stringent requirements may apply dependent on local and site specific factors. Therefore, all parameters need to be agreed with the Local Authority.		
Virgin Quarried Material	1 or 2 depending on the type of stone utilised, to confirm the inert nature of the material.	Standard metals/metalloids (should include as a minimum As, Cd, Cr, CrVI, Cu, Hg, Ni, Pb, Se, Zn)	The assessment criteria need to be UK based, e.g. LQM S4ULs, Defra C4SLs or other similarly derived GACs.
Crushed Hardcore, Stone, Brick (excluding asphalt)	Minimum 1 per 500m^3	Standard metals/metalloids (as above), PAH (16 USEPA speciation), asbestos, total TPH. Any additional analysis dependant on the history of the donor site (e.g. phenol, total cyanide, BTEX, MTBE).	
Greenfield/ Manufactured Soils	Minimum 3 Dependent on source and receptor, between 1 per 50m^3 and 1 per 250m^3	Standard metals/metalloids (as above), PAH (16 USEPA speciation), asbestos, pH and soil organic matter (SOM) (or calculated from total organic carbon (TOC)).	
Brownfield/ Screened Soils	Minimum 6 Dependent on source and receptor, between 1 per 50m^3 and 1 per 100m^3	Standard metals/ metalloids (as above), PAH (16 USEPA speciation), TPH (CWG banded), asbestos, pH and SOM (or calculated from TOC). Any additional analysis dependant on the history of the donor site (e.g. phenol, total cyanide, BTEX, MTBE).	

Table 3: *Summary of Soil Testing Frequency and Schedule (taken from YALPAG)*

7.3.12 The sampling frequency may be varied at the discretion of the Engineer depending on the nature and variability of the imported material and its source (subject to Local Authority approval).

7.3.13 Following assessment of the source of material, it may be necessary to test for additional determinands. The assessment criteria for the determinands to be tested for are presented in Table 4.

7.4 Assessment Criteria

7.4.1 The following table provides a list of assessment criteria for assessing suitability of imported topsoil/subsoil:

7.4.2 The criteria have been sourced from the LQM/CIEH Suitable 4 Use Level (S4UL). In addition, the category 4 Screening Level (C4SL) for lead has been used and the Atkins ATRISKSOIL screening level for cyanide has been used.

Contaminant of Concern	Assessment Criteria (mg/kg)
Arsenic	37
Cadmium	11
Chromium (total)	910
Copper	2400
Lead	200
Mercury	40
Nickel	130
Selenium	250
Zinc	3700
Cyanide	34
Acenaphthene	210
Acenaphthylene	170
Anthracene	2400
Benzo(a)anthracene	7.2
Benzo(a)pyrene	2.2
Benzo(b)fluoranthene	2.6
Benzo(ghi)perylene	320
Benzo(k)fluoranthene	77
Chrysene	15
Dibenzo(ah)anthracene	0.24
Fluoranthene	280
Fluorene	170
Indeno(1,2,3-cd)pyrene	27
Naphthalene	2.3
Phenanthrene	95
Pyrene	620
Phenols	120
Aliphatic Hydrocarbons >C5-C6	42
Aliphatic Hydrocarbons >C6-C8	100
Aliphatic Hydrocarbons >C8-C10	27
Aliphatic Hydrocarbons >C10-C12	130
Aliphatic Hydrocarbons >C12-C16	1100
Aliphatic Hydrocarbons >C16-C21	65000
Aliphatic Hydrocarbons >C21-C35	65000
Aromatic Hydrocarbons >C5-C7	70
Aromatic Hydrocarbons >C7-C8	130
Aromatic Hydrocarbons >C8-C10	34
Aromatic Hydrocarbons >C10-C12	74
Aromatic Hydrocarbons >C12-C16	140
Aromatic Hydrocarbons >C16-C21	260
Aromatic Hydrocarbons >C21-C35	1100
Asbestos	None detect

Table 4: *Assessment Criteria for Imported Sub/Topsoil*

7.5 Assessment of Chemical Test Results

7.5.1 BEK will be responsible for the assessment of all chemical test results to determine suitability of material to be used on site.

7.5.2 The assessment will be undertaken in accordance with current UK policy and guidelines and the method agreed with the local authority.

7.5.3 All chemical test results will be presented in the Validation Report.

7.6 Gas Measures

7.6.1 The following information should be included within a Verification Report to demonstrate the successful installation of ground gas protection on the site:

- Site details and objectives of verification
- A summary of the original site conditions and the ground gas regime.
- A description of the gas measures installed
- Details of the gas-resistant membrane manufacturer and type used (including sealing / jointing tape and pre-formed components e.g. top hats, corners). This shall include the manufacturer specification / datasheet.
- Installer and verifier and credentials of such organisations, i.e. level of competency of installer – NVQ Level 2 or general groundworker.
- Detailed description of any variations from the specification provided in this report, with explanation and justification of such deviations.
- As-built construction drawings (if available).
- A description of the verification approach – in this case visual inspection.
- Verification lines of evidence – including contractor records, proformas and photographic evidence.
- Details of all relevant communications held with regulatory bodies during implementation
- Verification conclusions, including any future gas monitoring or management requirements to manage residual hazards (anticipated none in this case due to passive approach)
- Any limitations to the measures installed/verified

7.7 Unexpected Area of Ground Contamination

7.7.1 As stated previously within this report the site has been subject to previous site investigation and as such, indicative ground conditions are known.

7.7.2 However, if any area of suspect material is encountered during the development of the site (i.e. that do not conform to the anticipated ground conditions) appropriate action will be taken. This will initially include the cessation of work in the area of concern and information BEK, who will attend site and carry out further assessment.

7.7.3 As a minimum BEK will notify the Local Authority and prevent any additional work in the area pending further assessment which may include sampling, testing and risk assessment.

8. REPORTING

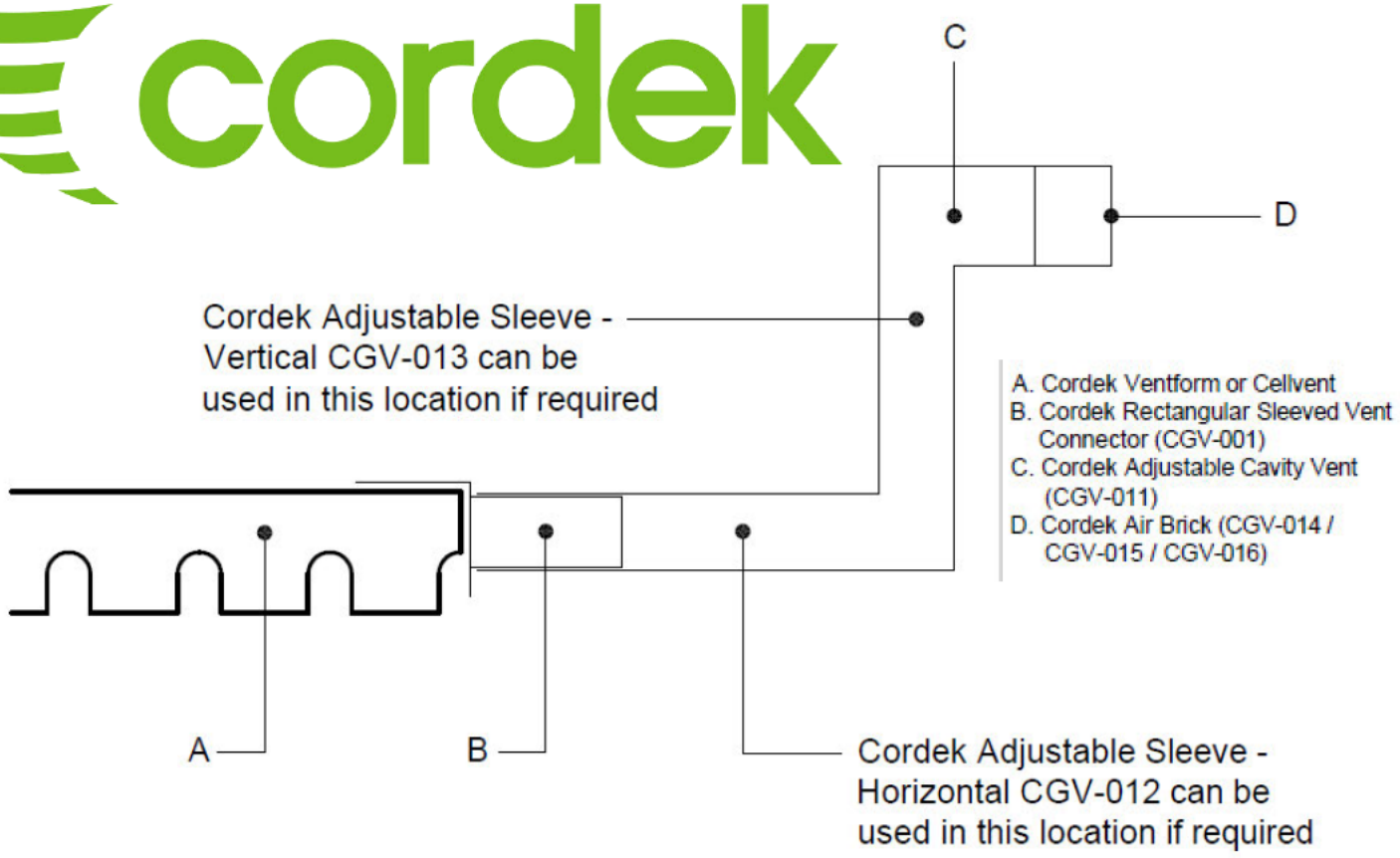
8.1 On completion of the remediation and mitigation works, BEK will prepare a Validation/Completion Report.

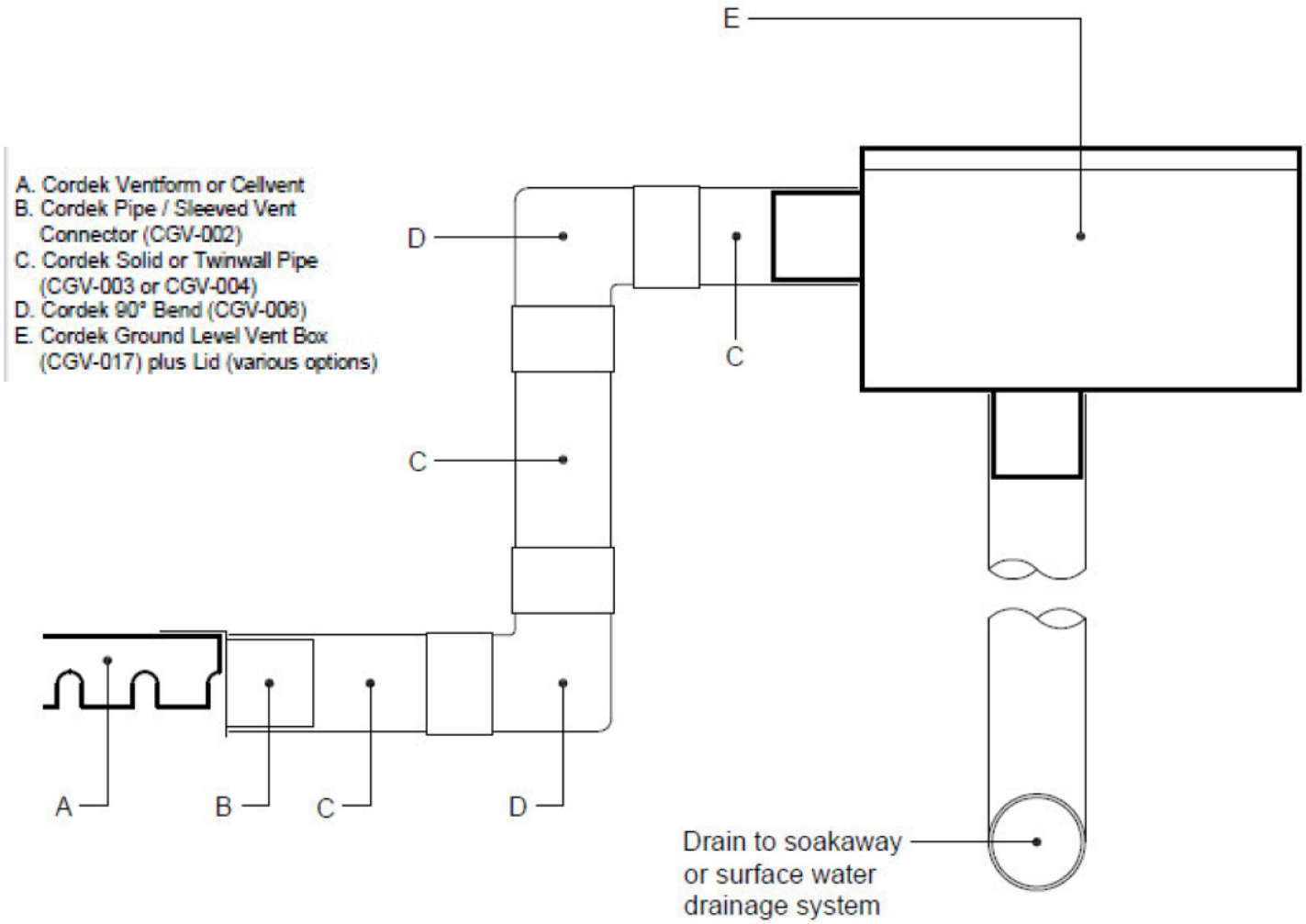
8.2 The Completion Report will describe the works undertaken in order to satisfactorily demonstrate that the works have been completed successfully and will include the following:

- A description of works undertaken
- Record of any unforeseen contamination encountered during the works
- Confirmation of the suitability of the gas membrane and confirmation of the installation of the gas mitigation measures
- Record of any material imported into the site for use in the residential gardens (if required)
- Validation samples recovered and tested
- Assessment of the chemical test results
- Photographs showing the remediation works being undertaken and completed

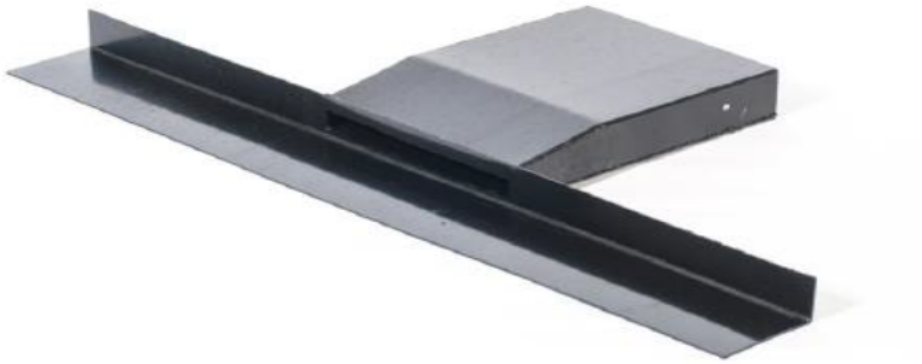
APPENDIX A

Dairy Barn Gas Design Drawings & Ventilation Calculations


C
D
Cordek Adjustable Sleeve - Vertical CGV-013 can be used in this location if required
A. Cordek Ventform or Cellvent
B. Cordek Rectangular Sleeved Vent Connector (CGV-001)
C. Cordek Adjustable Cavity Vent (CGV-011)
D. Cordek Air Brick (CGV-014 / CGV-015 / CGV-016)
A
B
Cordek Adjustable Sleeve - Horizontal CGV-012 can be used in this location if required


E
A. Cordek Ventform or Cellvent
B. Cordek Pipe / Sleeved Vent Connector (CGV-002)
C. Cordek Solid or Twinwall Pipe (CGV-003 or CGV-004)
D. Cordek 90° Bend (CGV-006)
E. Cordek Ground Level Vent Box (CGV-017) plus Lid (various options)
D
C
C
A
B
C
D
Drain to soakaway or surface water drainage system

Gas Vent Connectors



Product Reference	CGV-001
Description	Rectangular Sleeved Vent Connector
Dimensions	N/A
Compatible with	CGV 011, CGV 012

Product Reference	CGV-002
Description	Pipe / Sleeved Vent Connector
Dimensions	N/A
Compatible with	CGV 003*, CGV-004*, CGV-009A, CGV-010. *Coupling Required.

Pipes

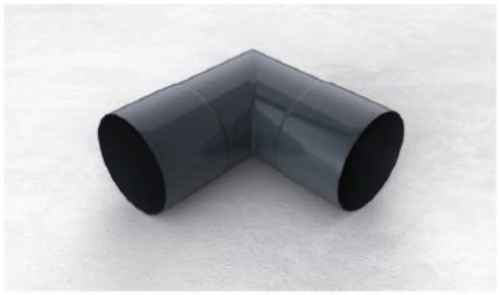
Product Reference	CGV-003
Description	Solid Pipe
Dimensions	3M Long 114mm external diameter
Compatible with	CGV-002, CGV-006, CGV-007, CGV-008, CGV-009, CGV-010, CGV-017, CGV-022, CGV-023

Product Reference	CGV-004
Description	Twinwall Pipe
Dimensions	3M Long 110mm external diameter
Compatible with	CGV-002, CGV-006, CGV-007, CGV-008, CGV-009, CGV-010, CGV-017, CGV-022, CGV-023

Product Reference	CGV-005
Description	Flexible Twinwall Pipe
Dimensions	1.5M Long 110mm external diameter
Compatible with	CGV-002, CGV-006, CGV-007, CGV-008, CGV-009, CGV-010, CGV-017, CGV-022, CGV-023

The CGV-003 and CGV-004 are supplied with one CVG-009 Coupler/Collar Connector (see above image and detail below)

Fittings

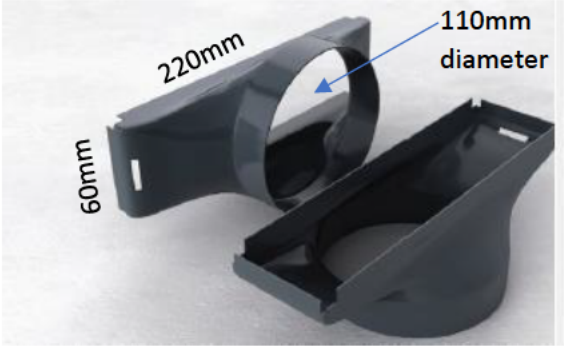


Product Reference	CGV-006
Description	90° Bend
Dimensions	N/A
Compatible with	CGV-003, CGV-004, CGV-005, CGV-017, CGV-025, CGV-026, CGV-027

Product Reference	CGV-007
Description	Tee Piece
Dimensions	N/A
Compatible with	CGV-003, CGV-004, CGV-005, CGV-017

Product Reference	CGV-008
Description	End Cap
Dimensions	N/A
Compatible with	CGV-003, CGV-004, CGV-005

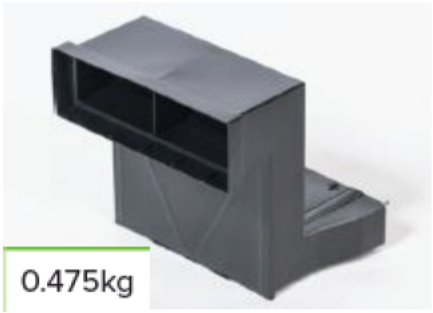
Product Reference	CGV-009
Description	Coupler
Dimensions	N/A
Compatible with	CGV-003, CGV-004, CGV-005, CGV-017



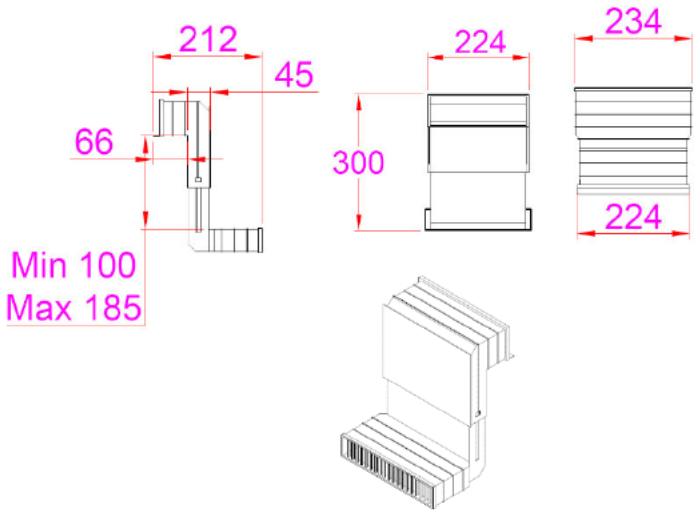
Product Reference	CGV-010
Description	Vent to Pipe Adaptor
Dimensions	N/A
Compatible with	CGV-003, CGV-004, CGV-005, CGV-011

Cordek Adjustable Cavity Vent & Extension Sleeves:

Adjustable Cavity Vent CGV-011



0.475kg



Adjustable between 3-4 brick courses

Black | Polypropylene

Adjustable Sleeve – Horizontal CGV-012

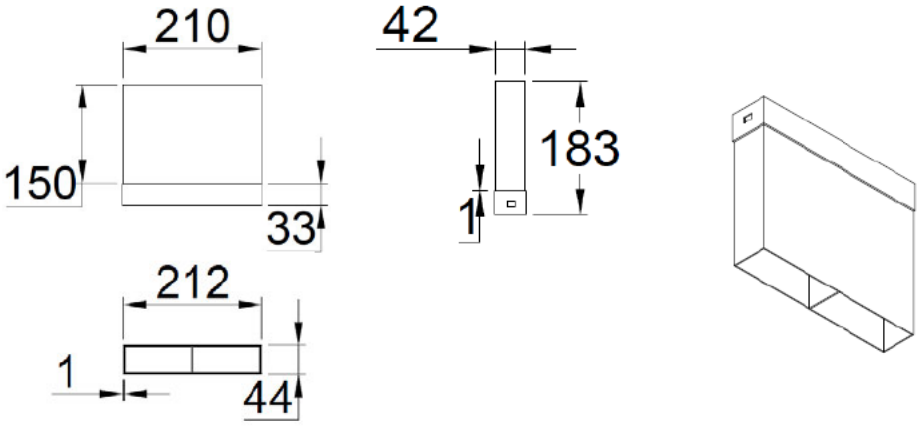
0.85Kg

Overall length of 550mm*

Black | HDPE

Adjustable Sleeve – Vertical CGV-013

0.25kg

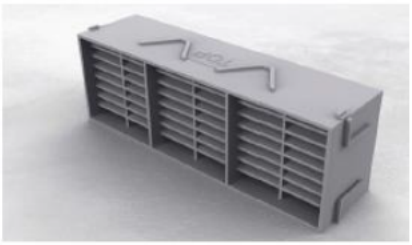


Extends cavity vent* additional 1-2 brick courses

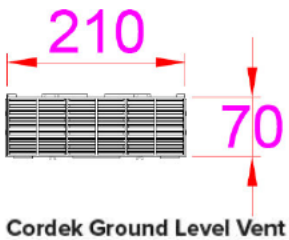
Black | Polypropylene

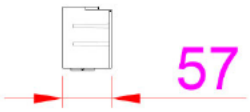
* Sleeves can be connected to increase overall length

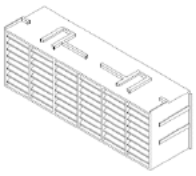
Cordek Air Bricks:



Available Colours / Finishes	Terracotta CGV-015, Buff CGV-014, Blue/Black CGV-016
Dimensions	210mm long x 70mm high x 57mm deep
Weight per unit	0.125kg
Material	Polypropylene
Manufacturing Process	Injection Moulded
Free Air Flow	7,600mm²

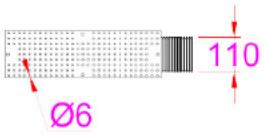




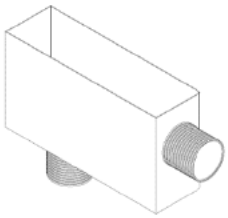


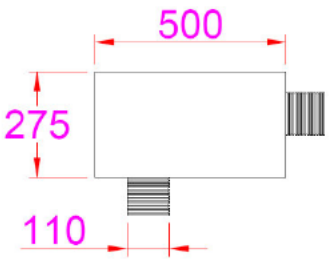
Cordek Ground Level Vent Boxes:

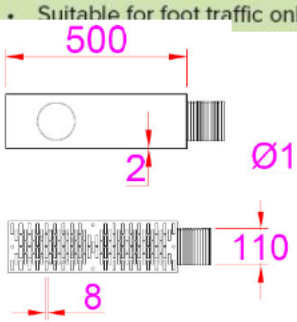
Product Reference	Product Description
CGV-017	Vent box only
CGV-018	Stainless steel, slotted lid
CGV-019	Stainless steel, perforated lid
CGV-020	Galvanised steel, slotted lid
CGV-021	Galvanised steel, perforated lid

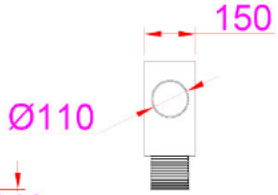


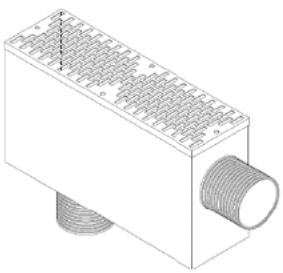
Dimensions	500mm long x 150mm wide x 275mm deep
Lid options – Materials	Stainless or galvanised steel
Lid options – Open air space	Slotted (8mm slots) – 19,200mm² Perforated (6mm holes) – 5,994 mm²
Features	• Stainless steel or galvanised steel lid secured using 4no. counter sunk threaded screws • Side connection into vent box prevents surface water from entering the gas inlet • 110mm diameter gas inlet and water outlet connections • Base connection to stormwater collection, land drainage or soakaway system • Removable mesh over drain outlet to prevent blockage by debris • Suitable for foot traffic only





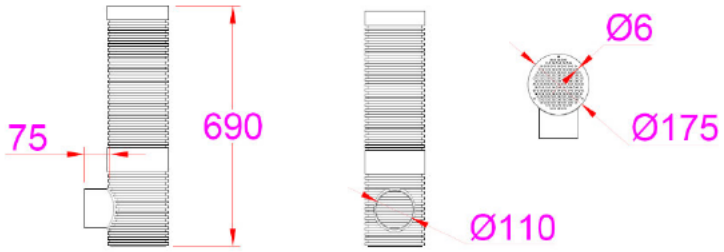


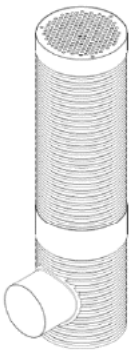




Cordek Circular Gulley Vent (with stainless steel lid):

Product Reference	CGV-022 Stainless steel, perforated lid
Dimensions	690mm overall length x 175mm diameter
Lid options – Materials	Stainless steel
Lid options – Open air space	Perforated (6mm holes) – 7,000mm²
Features	• Stainless steel lid secured using 4no. counter sunk threaded screws • 110mm diameter gas inlet and 175mm water outlet connector included • Base connection to stormwater collection, land drainage or soakaway system • Suitable for foot traffic only

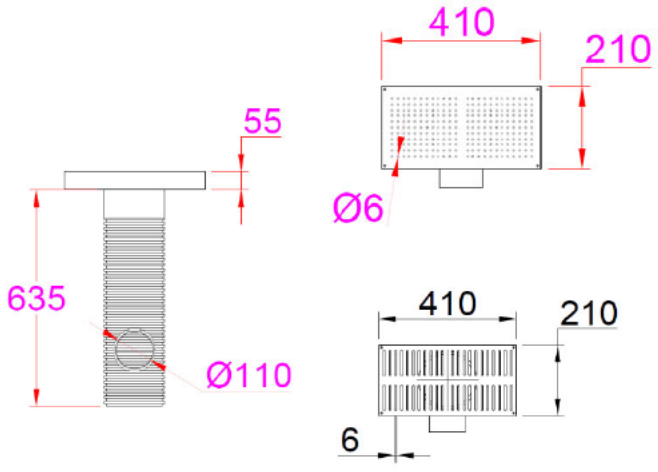


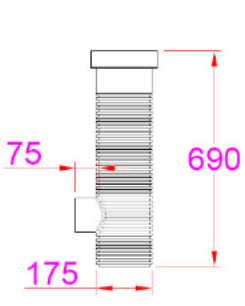


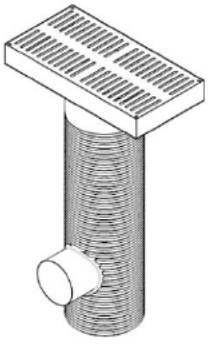
Cordek Rectangular Gulley Vent (with stainless steel lid):

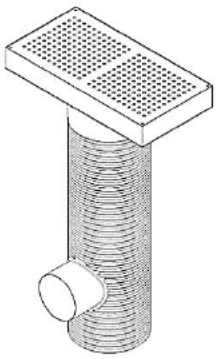
Product Reference	Product Description
CGV-023	Stainless steel, perforated lid
CGV-024	Stainless steel, slotted lid

Dimensions	690mm overall length Lid: 410mm long x 210mm wide
Lid options – Materials	Stainless steel
Lid options – Open air space	Slotted (6mm wide) – 18,100 mm² Perforated (6mm holes) – 6,840 mm²
Features	• Stainless steel lid secured using 4no. counter sunk threaded screws • 110mm diameter gas inlet and 175mm water outlet connector included • Base connection to stormwater collection, land drainage or soakaway system • Suitable for foot traffic only



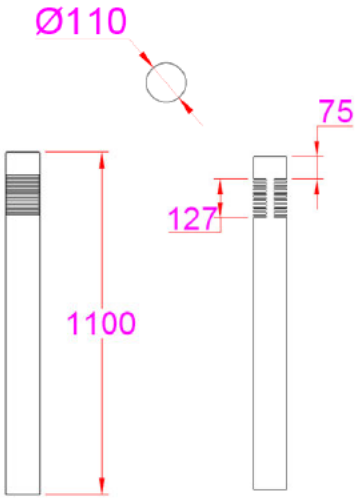






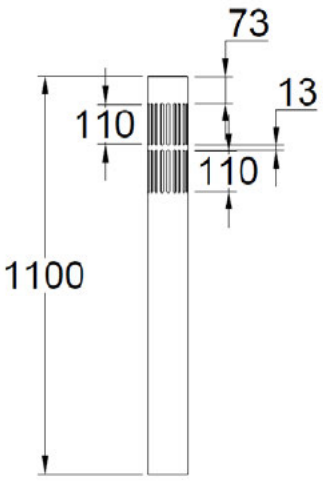
Cordek Gas Vent Bollards:

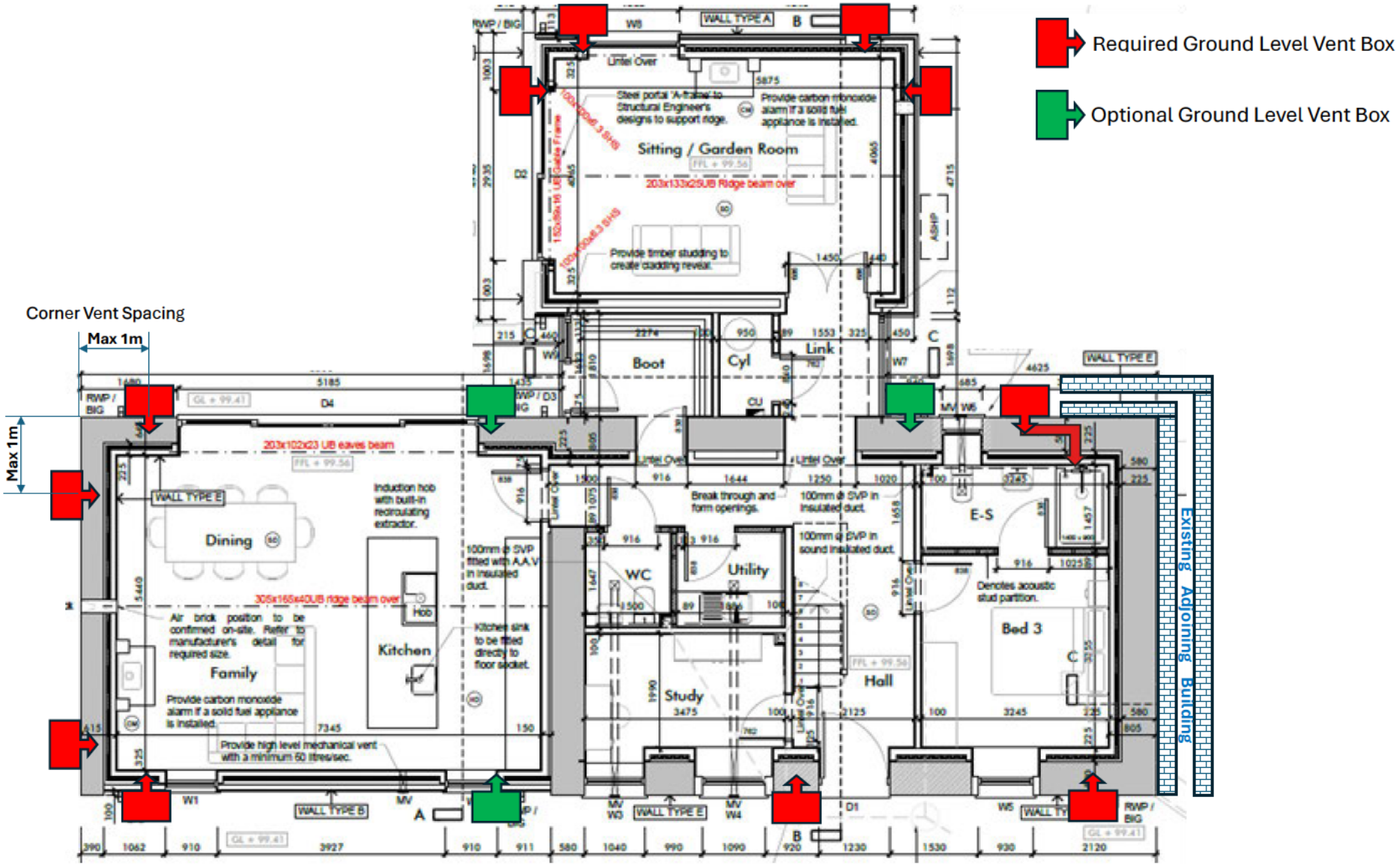
Product Reference	CGV-025
Description / Finish	Gas Vent Bollard Powder Coated Steel (to requested RAL)
Dimensions	110mm diameter, 1100mm high
Weight	7.92Kg
Free Air Flow	25,000mm²
Compatible with	CGV-006 CGV-009

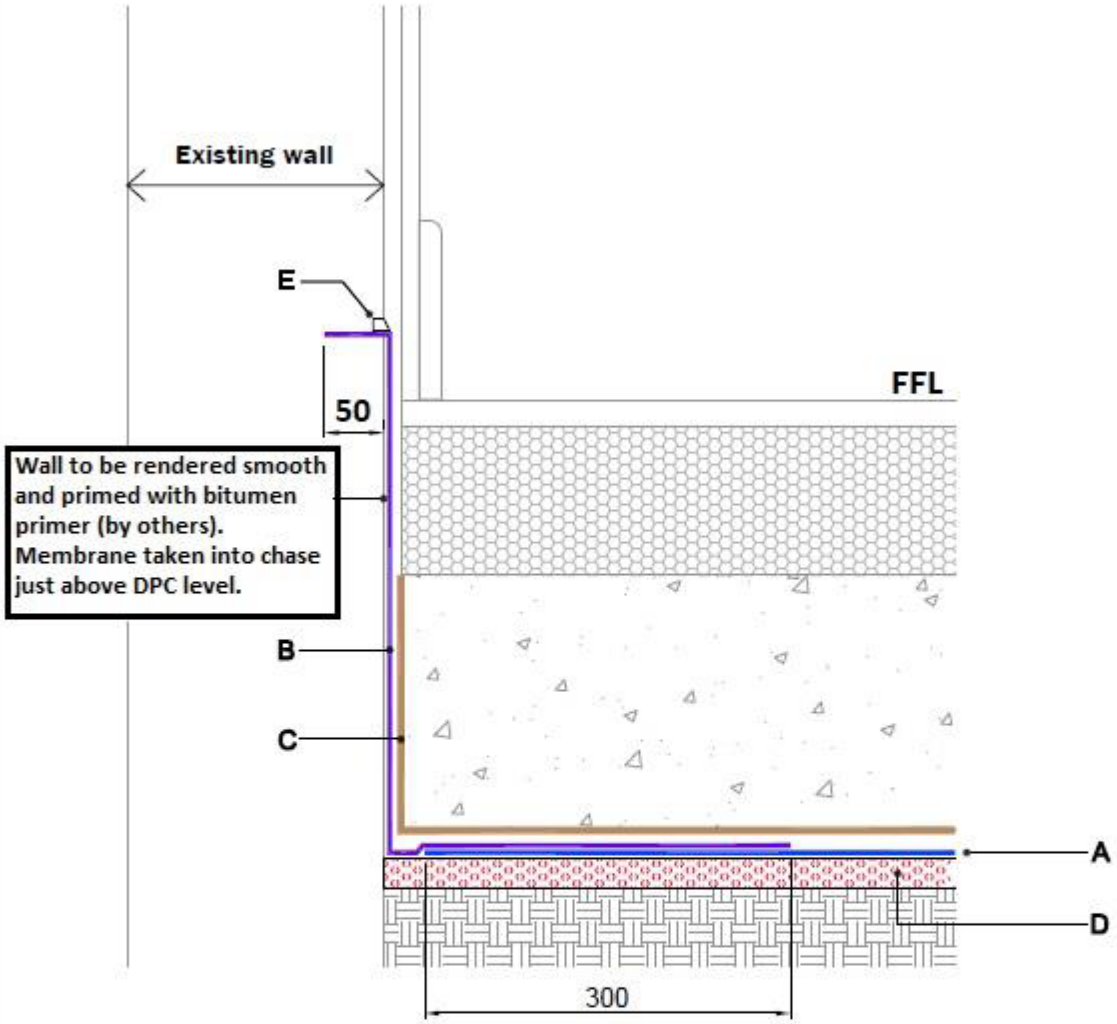


Product Reference	CGV-026
Description / Finish	Gas Vent Bollard Stainless Steel
Dimensions	110mm diameter, 1100mm high
Weight	7.92Kg
Free Air Flow	25,000mm²
Compatible with	CGV-006 CGV-009

Product Reference	CGV-027
Description / Finish	Gas Vent Bollard Black UV Stabalized PVC
Dimensions	110mm diameter, 1100mm high
Weight	1.475Kg
Free Air Flow	25,000mm²
Compatible with	CGV-006 CGV-009




Required Ground Level Vent Box
Optional Ground Level Vent Box
Corner Vent Spacing
Max 1m
Max 1m
Sitting / Garden Room
Boot
Cyl
Link
Dining
Kitchen
Family
WC
Utility
Study
Hall
Bed 3
E-S
Existing Adjoining Building
WALL TYPE A
WALL TYPE B
WALL TYPE E
Induction hob with built-in recirculating extractor.
Air brick position to be confirmed on-site. Refer to manufacturer's detail for required size.
Provide carbon monoxide alarm if a solid fuel appliance is installed.
Provide high level mechanical vent with a minimum 60 litres/sec.
Kitchen sink to be fitted directly to floor socket.
Break through and form openings.
100mm ø SVP in insulated duct.
100mm ø SVP in sound insulated duct.
Denotes acoustic stud partition.
Steel portal 'A-frame' to Structural Engineer's designs to support ridge.
Provide timber studding to create cladding reveal.
203x133x25UB Ridge beam over
203x102x23 UB eaves beam
305x165x40UB ridge beam over
Lintel Over
RWP / BIG
ASHP



Materials :-	Notes :-
Refer to Cordek technical data sheets for full detailed material specification **A. Cordek TriGas Membrane** **B. Cordek Gas-Resistant Self-Adhesive Membrane** **C. Protection Board by others** **D. Venting Layer** **E. Sealant by others**	- This detail is issued for guidance purposes only, with final approval required from the designer - Do not scale from drawing, use dimensions provided - All laps and junctions must be fully sealed with appropriate welding techniques or jointing system - The intended construction sequence should be considered prior to selection of the appropriate Cordek standard detail to ensure that installation is practical and achievable - In accordance with BS8102:2009, should hydrostatic water pressure be a risk, additional waterproofing methods should be considered

Standard Detail

cordek

Tel : 01403 799600
Email : techsupport@cordek.com

Drg. Title:
Cordek Methane / CO2 Protection System
Typical Existing Wall Abutment Detail

Drawn: JP

Date: March 2024 | Scale: NTS

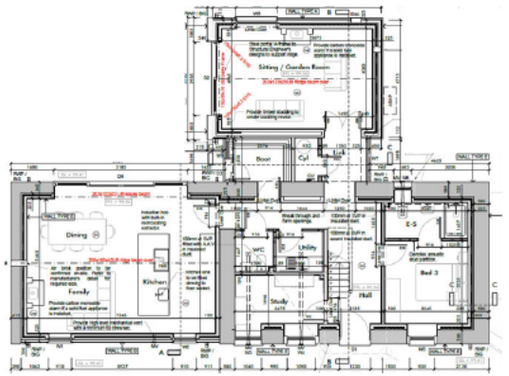
Drg. No. ENG/GP/MEM/TRIG/19 | Rev: C

Project Title: Crow Trees Farm
Location:Crow Trees Brow, Chatburn, Lancashire BB7 4AA

Calculation Date 03/03/2025
Completed By Paul Hood

Opp: 228732 Ventform 80/50

Building Width (m)	13.1	Approx				
Building Length (m)	18.5	Approx				
Available Vented Perimeter (m)	53.29	Total Exposed Perimeter (m)	59.8	Void Area(m^2)	166	
Number of External Corners	4	Note: vents to be placed 1.0m either side of each external corner				
Vented Perimeter (m)	45.29					



Airflow in accordance with BS 8485 + A1: 2019 requires a minimum airflow of: 2,210 mm^2 per Linear metre run = Good
Required for sites < CS4

Total Volume of Air (Good Performance) 117,771 mm^2

Minimum Volume of Air (exc corner vents) 48,651 mm^2 4,420 mm^2 per Linear metre run = Very Good
Required for CS4 Sites or above

Type of Gas Vent Box: CGV 018 Cordek Ground Vent Box with slotted lid

Air Flow Volume Capacity 19,200 mm^2 1,500 mm^2 per Linear metre run = Air Ventilation - Minimum = 89,700 mm^2

Maximum Vent Centres (m) 15.10 500 mm^2 per / building square metre = Air Ventilation Minimum = 83,000 mm^2

Minimum Number of Gas Vents 11

The above is in accordand with NHBC Standards Section 5.2.1 Ventilation and Approved Document C section 4.19 "Suspended Concrete Floors" of the Building Regulations

Cross Beam Bridge Addition pipework required to increase airflow to all part of the building

100mm Drainage Pipe **7,238** mm^2 of air flow capacity (Internal Area of Pipe)

178mm(150mm ID) Twinwall Pipe 17,671 mm^2 of air flow capacity

	Beam 1		Beam 2		Beam 3		Beam 4
Length of Cross Beam	0	Total Pipe Area	0	Total Pipe Area	0	m	0
Number of Beams	0	0 mm^2	0	0 mm^2	0		0
	Good	Very Good	Good	Very Good	Good		Good
Number of additional Pipes/Beam	0	0	0	0	0		0
Maximum Pipe Centres (m)	0.00	0.00	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!

Based on 110mm Drainage Pipe

Result Summary

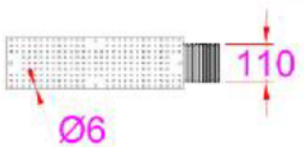
Grand Total Area of Free Air Movement Through Pipes 0 mm^2

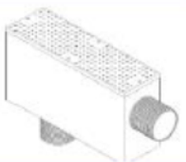
Vent Type	Vent Flow Capacity (mm^2)	Corner Vents (0.45m spacing)	Minimum Intermediate Vents	Total Vents	Max Intermediate Vent Spacing(m)	Total Additional Pipes Cross Beam 1	Total Additional Pipes Cross Beam 2	Total Additional Pipes Cross Beam 3	Total Additional Pipes Cross Beam 4	Total Number of Cross Beam Pipes
CGV 018 Cordek Ground Vent Box with slotted lid	19200	8	3	11	15.1	0	0	0	0	0

The above venting regime is in accordance with the recommendations set out in Table B.3 of BS8485: 2015 + A1:2019

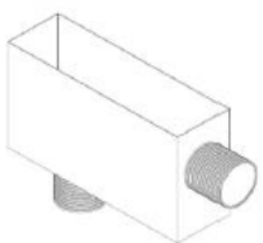
Cordek Ground Level Vent Boxes:

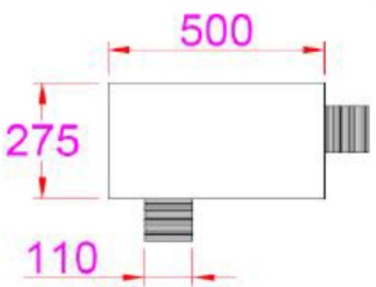
Product Reference	Product Description
CGV-017	Vent box only
CGV-018	Stainless steel, slotted lid
CGV-019	Stainless steel, perforated lid
CGV-020	Galvanised steel, slotted lid
CGV-021	Galvanised steel, perforated lid

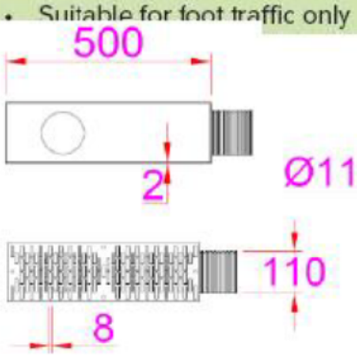


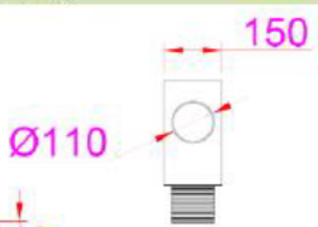


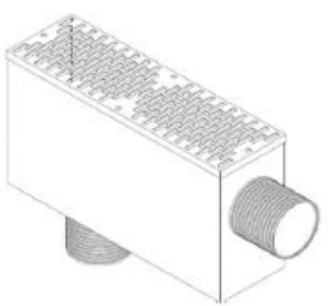
Dimensions	500mm long x 150mm wide x 275mm deep
Lid options – Materials	Stainless or galvanised steel
Lid options – Open air space	Slotted (8mm slots) – 19,200mm² Perforated (6mm holes) – 5,994 mm²
Features	• Stainless steel or galvanised steel lid secured using 4no. counter sunk threaded screws • Side connection into vent box prevents surface water from entering the gas inlet • 110mm diameter gas inlet and water outlet connections • Base connection to stormwater collection, land drainage or soakaway system • Removable mesh over drain outlet to prevent blockage by debris • Suitable for foot traffic only

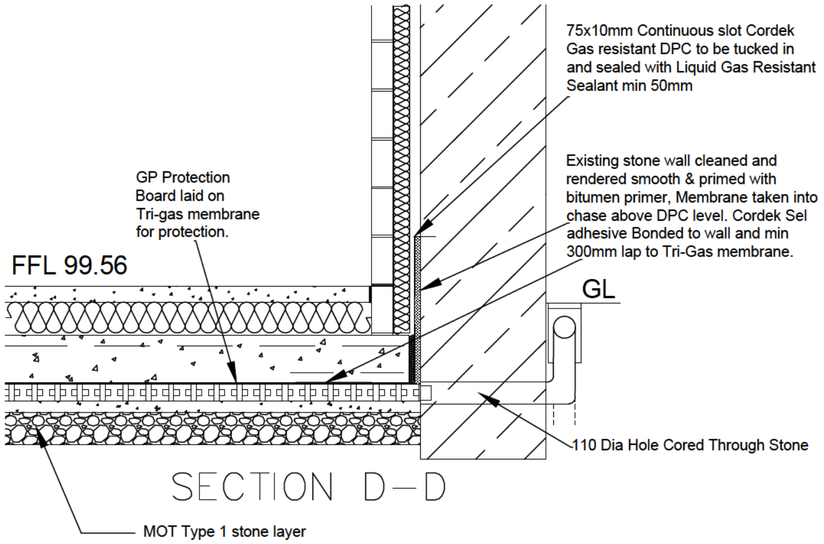




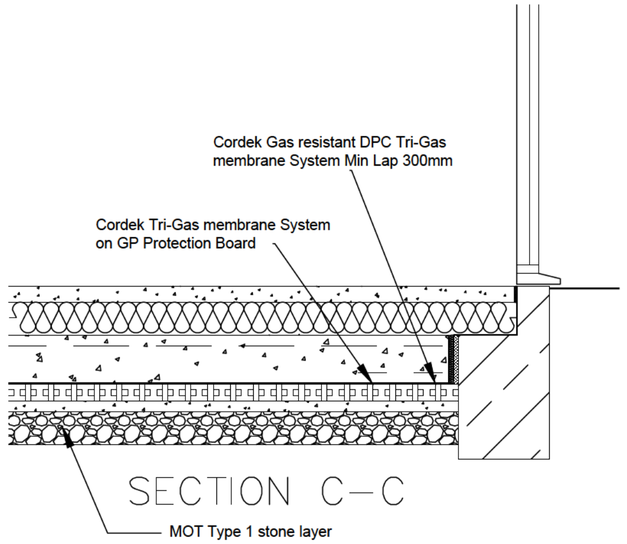




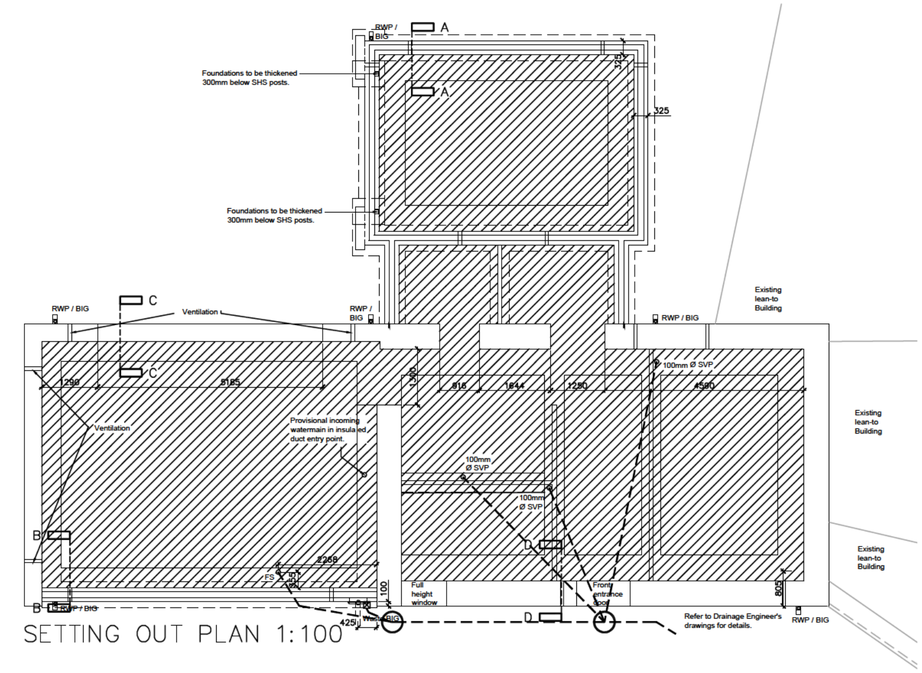




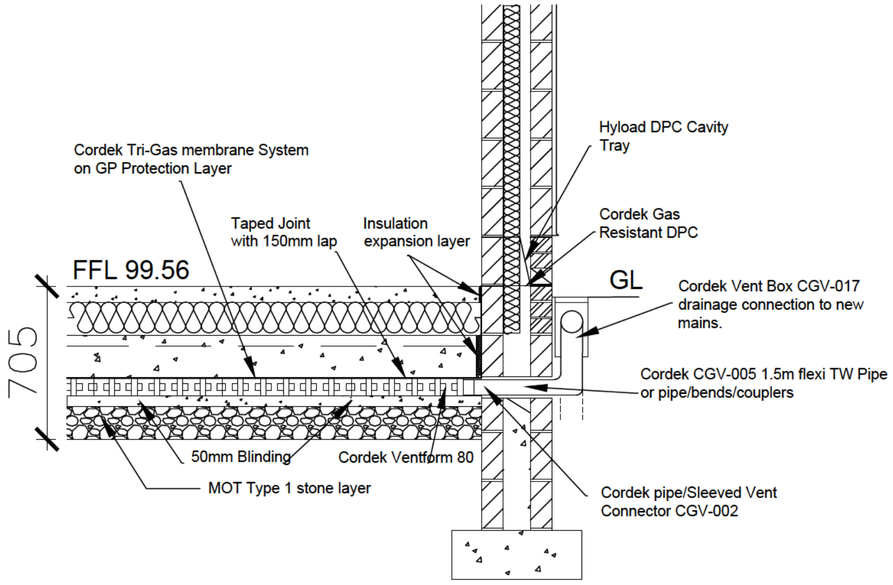
SECTION D–D



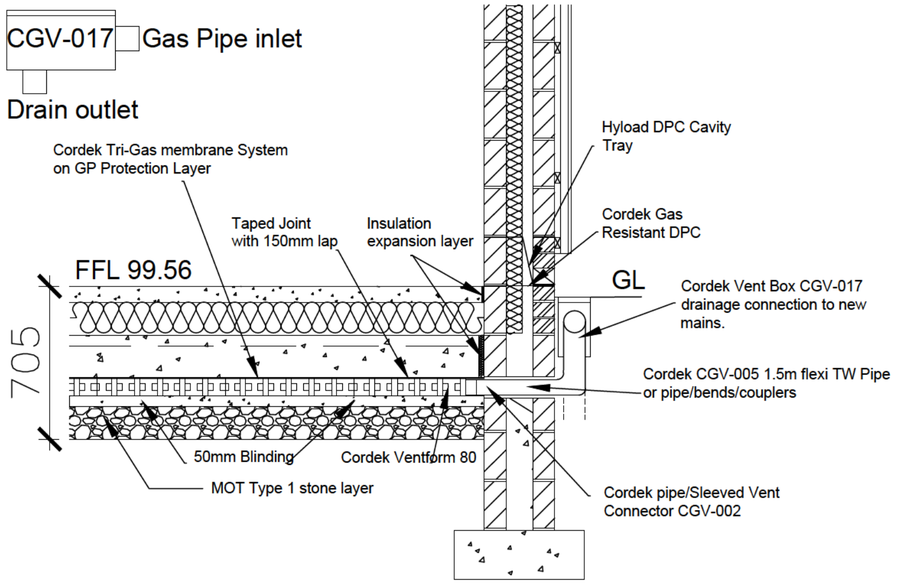
SECTION C–C



SETTING OUT PLAN 1:100



SECTION B–B



SECTION A–A

Dairy Barn, Dutch Barn & Garage
Crow Trees Farm
Chatburn

Section and floor plan to be read in conjunction with Cordek Design details

Dwg No's

ENG/GP/VENT/06 Rev A
ENG/GP/MEM/TRIG/19 Rev C
ENG/GP/MEM/TRIG/16 Rev C
ENG/GP/VENT/15
ENG/GP/MEM/TRI/08 Rev B
ENG/GP/MEM/TRIG/10 Rev B
ENG/GP/MEM/TRIG/9 Rev B
CTF/ VENT/SPACING Rev 1

Scale 1/20@A2

Rev A Full floor area covered with Cordek Sheets 04/03/25

Rev B Revised in-line with Cordek Designs 10/03/25

ISSUED BY:
Pringle Homes
The Coach House, Hollowforth Lane,
Woodplumpton, PRESTON,
PR4 0BG
TELEPHONE (01772) 690445
E MAIL:- info@pringlehomes.co.uk
Website:- www.pringlehomes.co.uk

PROJECT:
Crow Trees Farm
Barn

TITLE:
Sections & Floor Plan for Gas Membrane & Ventilation installation
AS Cordek Design Details

DRAWN BY:	DATE DRAWN:	SCALE(S) AT A1	PURPOSE OF ISSUE
NFM	March 2025	as specified	Construction
CHECKED BY:	APPROVED BY:	DRAWING NUMBER:	
DATE:	DATE:	PH-CTB-01	

APPENDIX B

Example Gas Proforma Sheet

BEK Ground Gas Validation Inspection Record

Site:				**Inspected by:**	
Plot No:		**Date:**		**Inspection Method:**	

	Inspected Item	Y/N	Comments/Defects/Remedials requested	Photo? Y/N
1.1	External Wall Airbricks			
1.2	Sub-Floor Void/ Pressure Relief / Passive Venting			
1.3	Any internal sleeper walls – require appropriate ventilation			
1.4	External vent trenches/ducts			
2.1	Condition of subgrade and underside of membrane			
2.2	Gas Membrane type including associated components			
2.3	Gas Membrane Condition			
2.4	Lapping Design/Seals of Laps and Joints			
2.5	Perimeter Installation/Cavities and Corners			
2.6	Service Entries			
2.7	Are there any level changes/steels/abnormals?			

Additional Notes:

BEK Ground Gas Validation Inspection Record

	Inspected Item	Comments/Defects/Remedials requested
1.1	External Wall Airbricks	Meet or exceed the BS8485:2015+A1:2019 requirements of 1,500 mm²/m run of wall on at least two opposite sides. A typical air brick provides (6,000mm2 vent area). Check design
1.2	Sub-Floor Void/ Pressure Relief / Passive Venting	Check the presence of a vented void / pressure relief pathway, including measuring that this is of a sufficient depth and not been filled or otherwise compromised. Subfloor Void minimum 150 mm for residential properties with beam and block construction (unless otherwise specified by design drawing)
1.3	Any internal sleeper walls	Venting of sleeper walls to provide adequate flow-through within the void (6,000 mm2/m for low rise residential). Ventilation holes (honeycomb brickwork/pipe crossings?) – size, spacing, location in accordance with design? Check that none of the walls are blocking off unvented sections within the void
1.4	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?
2.1	Condition of subgrade and underside of membrane	Check that the subgrade does not contain rough/uneven surfaces, is appropriately clean and that there are no sharp object E.g. projections, and mortar deposits. Check protective sand blinding layer or geotextile (if specified) is present and meets design specification
2.2	Gas Membrane Type including associated components	Ensure that the correct membrane have been used including components eg sealing/jointing tape, self-adhesive gas membrane, pre-formed tophats, corners, damp proof course
2.3	Gas Membrane Condition	Inspect for rips/tears/punctures/stretching of membrane. Confirm that the membrane is free from dirt, evidence of heavy foot traffic and building materials. Specify and photograph any repairs carried out during inspection
2.4	Lapping Design/Seals of Laps and Joints	Minimum lap as per manufacturers specification of 150 mm. Are joints lapped and sealed in accordance with manufacturers requirements/specification? Check double sided tape is sufficiently stuck and that lap tape isn't lifting/no fish mouths
2.5	Perimeter Installation/Cavities and Corners	Check that membrane goes across the cavity or that membrane jointed correctly to corners, stop ends and threshold (preformed corners/SAGM). Cavity should be free from debris and water.
2.6	Service Entries	Weld sealed using SAM or Tophats need to be correctly installed with no gaps between tophat and membrane and no lifting of tape. Double sided tape should be used around tophat and service entry. Jubilee clips around the pipe and correct sealing arrangements to the membrane/pipe infrastructure as per the manufacturers specification
2.7	Are there any level changes/steels/abnormals?	Changes of level are complex and should be undertaken in accordance with a site specific 3D drawing of the gas membrane detail. Steels require primer with liquid gas membrane and/or self-adhesive membrane