

Remediation Strategy

At:

Former St John's Ambulance Station
Armoury Drive,
Gravesend,
Kent,
DA12 1CT

For:

The Longley Group

Private and Confidential

Ref: 4551 22 04 29 RPT 02 REV B BD SP

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Association of Geotechnical &
Geoenvironmental Specialists



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Introduction

1.1 REASON FOR THE REPORT

Sevenoaks Environmental Consultancy Ltd (SEC) was appointed by the Longley Group Ltd to prepare a Remediation Strategy in support of proposed re-development of the site known as Former St John's Ambulance Station, Armoury Drive, Gravesend, DA12 1CT.

The site was previously developed with a St John's Ambulance Station garage and a Water Tower, which at the time of writing had been partially demolished. It is proposed to redevelop the site with 1 No. 2 storey block of flats to the western end of the site and 2 No. detached bungalows to the eastern end of the site with gardens (see Appendix A Figure 1 for Proposed Development Layout Plan). Previous reports have been produced for the site including; a Geo-Environmental Desk Study by Soils Ltd (Ref: 17753/PIR_R26) dated August 2019 and a Preliminary Geo-Environmental Site Investigation Report by SEC (Ref: 4551 22 04 21 Rpt 06 Rev B EH CW) dated April 2022. Since the original version of this document was written additional reports have been produced including: Ground Gas Risk Addendum Ltr Rpt (Ref: 4551 22 07 11 Ltr Rpt 01 Rev B AS SP) dated November 2022 Technical Addendum to Remedial Strategy (Ref: 4551 22 07 04 Tech Adden 01 Rev A BD SP) dated July 2022 and Supplementary Geo-Environmental Site Investigation (Ref: 4768 22 08 24 Ltr Rpt 02 Rev A AS SP) dated August 2022. The findings from these previous assessment reports are summarised in more detail later in Section 2.0.

The previous reports and this Remediation Strategy have been produced in support of Planning Condition 5 associated with the proposed development of the site under Planning Permission 2020/0561. Additionally, this Remediation Strategy aims to inform the redevelopment Contractor of the remedial strategy / processes to be employed during the proposed development such that potential contaminated land risks to receptors are managed appropriately during the site's redevelopment and that any remedial work undertaken is adequately validated and documented to the satisfaction of the LPA.

It is noted that the previous version of this document has been revised to take account of Regulatory requirements in relation to the conduct of further ground gas monitoring, inclusion of ground gas protection measures and verification plan, clarification of the inclusion of a marker layer within the cover system for areas of landscaping and a verification plan associated with the reduced formation and imported soil sampling strategy.

1.2 SCOPE OF REPORT

In order to help discharge contaminated land planning conditions, this report references and discusses earlier contaminated land assessment reports, which have been written previously to help determine the ground contamination status of the site. This report provides details on the strategy for inspecting and remediating ground contamination identified at the site as well as other site specific operational details required to help mitigate potential risks to receptors associated with the proposed development including construction workers, future site users, neighbouring sites and controlled waters.

1.3 SITE DESCRIPTION

The site is located at NGR 565110 173560 and covers an area of ~0.114 hectares. It is an approximately 'L' shaped plot which was previously occupied by a former St Johns Ambulance garage building, 1 No. Water Tower Structure and a long tarmac access drive trending through the site in an east to west orientation. Some areas of soft landscaping were also present across the site. SEC note that at the time of writing, the Client had carried out the partial demolition of the former St Johns Ambulance garage which included breaking out the garage ground slab and removal of some of the walls. The site is understood to have previously formed part of Gravesend barracks.

The site is bounded by residential houses on all sides and Albert Murray Close to the north.

1.4 PREVIOUS REPORTS

The following reports are relevant to the geo-environmental assessment of the site and should be considered with this document:

- Phase 1 Geo-Environmental Desk Study Report (Ref: 17753/PIR_R26) Dated August 2019 by Soils Ltd;
- Preliminary Geo-Environmental Site Investigation Report (Ref: 4551 22 04 21 Rpt 06 Rev B EH CT) dated April 2022 by SEC;
- Ground Gas Risk Addendum Ltr Rpt (Ref: 4551 22 07 11 Ltr Rpt 01 Rev B AS SP) dated November 2022 by SEC;
- Technical Addendum to Remedial Strategy (Ref: 4551 22 07 04 Tech Adden 01 Rev A BD SP) dated July 2022 by SEC; and
- Supplementary Geo-Environmental Site Investigation (Ref: 4768 22 08 24 Ltr Rpt 02 Rev A AS SP) dated August 2022 by SEC.

This current report should be read in conjunction with these previous documents.

It is noted that the site is potentially archaeologically sensitive and as such archaeological constraints should be considered in parallel with any intrusive groundwork on site associated with the proposed development. Potential UXO risks should also be considered prior to intrusive groundwork.

2 Summary of Contamination Assessment

2.1 INTRODUCTION

Previous contaminated land assessment reports for the site have been carried out by Soils Ltd and SEC. Whilst the following provides a brief summary of the geo-environmental findings recorded by the previous reports reference should be made to the aforementioned documents for a more comprehensive view of the results and their implications.

2.2 REVIEW OF PREVIOUS REPORTS

Phase 1 Geo-Environmental Desk Study Report by Soils Ltd (Ref: 17753/PIR R26) Dated August 2019:

The previous Desk Study Report was written as part of a pre-planning exercise based on a proposed end use for the site consisting of four different possible residential redevelopment options. It was understood that the preferred development was based on 2No. bungalows and 1No. block of 2-storey flat which is the same scheme that is proposed currently.

The site layout and usage noted in the previous Desk Study Report was generally consistent with the existing layout at the time of writing this current document except for the commencement of demolition of the St Johns Ambulance garage building.

Historically the Desk Study reported that the site comprised an undeveloped plot until 1874 when the water tower and garage were built. The site then remained unchanged until present day. Off site, between 1866 to 1874 a chalk pit was identified ~200m to the north of the site and a rail line ~140m north, with several tanks noted between 1954 to 1981 ~76m northeast.

The published geology locally to the site was recorded to be Thanet Formation bedrock over Lewes Nodular Chalk Formation with no overlying superficial deposits. The Thanet Formation was classified as a Secondary A Aquifer and the Lewes Chalk was noted to be a Principal Aquifer.

Potential on site sources identified included an electrical substation from 1951 [although it was noted that based on the site area for the current redevelopment scheme, the substation is located outside of the site footprint and is therefore actually off site], site use as Gravesend Barracks with a garage between 1874 and 1981 and an above ground storage water tank since 1936.

Many potential off-site sources were listed in the desk study and these have been summarised to include; an infilled chalk pit ~167m north east of the site between 1866 and 1897, tanks identified ~48m and 76m east and north east between 1954 and 1993 respectively and a garage identified ~142m north west between 1954 and 1999.

Preliminary Geo-Environmental Site Investigation Report (Ref: 4551 22 04 21 Rpt 06 Rev B EH CT) dated April 2022 by SEC

Further to the findings of the desk study report a preliminary intrusive site investigation was conducted by SEC. The site layout during the site investigation was noted to be generally consistent with that described in the earlier Desk Study with the exception of the recent demolition work. The site investigation was based upon the same residential end use as the previous desk study. It is noted however that a gas leak had occurred locally to the site prior to the site investigation which had reportedly been repaired by Southern Gas Networks although the manhole in Alberly Murray Close to the north of the site was noted to still exhibit a mercaptan odour.

The scope of the site investigation included the conduct of 5 No. mini boreholes up to 4m bgl (WS01 – WS05) using a Continuous Dynamic Sampler drill rig. Environmental ground gas and groundwater monitoring wells were installed within the boreholes to facilitate ground gas and groundwater monitoring. Soil samples recovered from the boreholes were sent for laboratory analysis for a range of contaminants including metals, asbestos (presence / absence and quantification), speciated PAHs, TPH, phenols, VOCs and WAC. 3 No. groundwater monitoring visits were conducted as part of the assessment. Ground gas monitoring to inform a ground gas risk assessment was conducted however is on going at the current time of writing.

The ground conditions identified on site generally comprised Made Ground up to between 0.25m bgl (WS04) and 1.35m bgl (WS05) which was relatively homogenous and consisted of gravelly Clay with flint, brick, concrete, tile and tarmac fragments. Underlying the Made Ground natural Sand deposits were encountered and proven up to 4.45m bgl.

Visual and olfactory observations indicative of potential ground contamination included VOC headspace test results up to 40.8ppm (WS2 at 3.5m bgl) and a hydrocarbon odour. Slightly elevated VOCs were identified within a sample recovered from WS02 at 3.50m bgl. Additionally potential cement bonded asbestos sheeting fragments were identified within TP01 (0.2m bgl) and TP03 (0.5m bgl).

Based upon the findings of the assessment the following sources of contamination were identified;

- Potentially coal tar rich tarmac surfacing associated with the existing site access road up to 0.15m bgl (WS01) which exhibited elevated concentrations of PAHs including benzo(a)pyrene up to 48.8mg/kg and TPH up to 2780mg/kg;
- Made Ground identified across the site up to 1.35m bgl (WS05) generally comprising gravelly Sand / sandy Gravel with varying frequencies of flint, brick and concrete inclusions, fragments of cement bonded asbestos sheeting (TP01 and TP03) and elevated concentrations of lead (up to 797mg/kg TP02 at 0.3m bgl) and PAHs including benzo(a)pyrene (up to 17.6mg/kg TP02 at 0.3m bgl);
- Former site use as a garage, with an above ground tank and as part of a barracks; and
- Potentially elevated concentrations of ground gases (reported separately within a follow on Ground Gas Risk Assessment Addendum, reviewed below)

Potential off-site sources of contamination identified included;

- An infilled Chalk Pit identified ~167m northeast of the site between 1954 - 1981;
- Milton Barracks identified ~140m east of the site between 1947 – 1992;
- A Tank identified ~76m northeast of the site between 1954 – 1993;
- Gravesend Barracks identified ~23m northeast of the site between 1909 – 1981;
- A Tank identified ~49m southeast of the site between 1954 – 1978; and
- An Electrical Substation ~25m north of the site since 1951.

To help mitigate potential risks to receptors associated with sources of contamination the following recommendations were provided;

- That the remaining ground gas monitoring be completed in order to inform the Ground Gas Risk Assessment Addendum to supplement the findings of this assessment and to inform the requirement for any protective measures within the building design;
- That prior to the proposed development, all general rubbish and drums of fuel should be appropriately removed from site and disposed of at suitably licensed facilities (all waste disposal documents to be retained);
- That the existing potentially coal tar rich tarmac surfacing be disposed of from site to suitably licensed waste management facilities as hazardous waste under waste code 17 03 01. All waste disposal documentation should be retained for inclusion within a future Validation Report. To help facilitate appropriate waste disposal from site, the tarmac surfacing should be carefully excavated and segregated from the underlying material under the supervision of an Environmental Consultant;
- That a watching brief be maintained by an Environmental Consultant during the removal of the hardstanding across the site and in particular the ground slab of the former buildings. Confirmatory validation samples should be recovered for analysis to confirm an absence of impact associated with contaminants of concern including metals, PAHs, hydrocarbons and asbestos;
- That remedial excavation be conducted to remove the lead and asbestos impacted Made Ground identified on site for appropriate disposal to suitably licensed facilities. Remedial excavation should be overseen by an Environmental Consultant and be certified by soil validation sample analysis from the sides and base of the remedial excavation. Any imported backfill material (e.g. engineered fill / aggregate, subsoil or topsoil) should be chemically validated in relation to suitability for use on site as part of the proposed development, including the review of the supplier's chemical batch data prior to import and chemical analysis of validation samples following importation to site;

- That an asbestos picking exercise be conducted during the excavation of asbestos impacted material locally to TP01 and TP03, to remove fragments of cement bonded asbestos sheeting for separate disposal. Asbestos picking should be conducted by Category A & B Asbestos Awareness trained operatives and to help mitigate potential Health and Safety risks appropriate PPE / RPE should be worn by operatives during the remedial excavation and asbestos picking, including disposable suits and FFP3 masks;
- That all waste arisings should be disposed of from site appropriately in accordance with EA WM3 guidance. The impacted Made Ground should be disposed of as Non-Hazardous waste under waste code 17 05 04 and picked asbestos containing material fragments as Hazardous waste under waste code 17 06 05. All arisings should be segregated based on waste stream types and according to waste classification. All waste disposal tickets should be retained;
- That a "clean" cover system be provided to a minimum thickness of 475mm across landscaped / garden areas. The cover system should comprise the provision of a high visibility geotextile marker layer (permeable geotextile or similar) overlain by imported certified "clean" topsoil to the required minimum thickness. Subject to existing and proposed site levels it may be necessary to remove some existing soils to facilitate the cover system. Prior to delivery of any imported topsoil to site, the supplier's chemical batch data should be provided to an Environmental Consultant for review and following provision of the cover system to landscaped areas it should be validated by an Environmental Consultant. This should include chemical analysis of a representative number of imported cover system validation samples based on a minimum frequency of 1 validation sample per garden / landscaped area as a minimum or 1 sample per 50m³ per material source for larger areas. In addition the thickness of cover system should be certified;
- That the water supply pipework included within the design of the proposed development should be chemically resistant barrier pipe. Alternatively the water supplier should be contacted to confirm chemically resistant barrier pipe is not required;
- That groundworkers should wear appropriate PPE/RPE, work in well ventilated areas, avoid confined spaces, avoid contact with soil and groundwater, not smoke, adopt high standards of personal hygiene, and operate with due care;
- That a Discovery Strategy should be implemented on site during the redevelopment work which should include for the immediate reporting of any potential indicators of ground or water contamination e.g. asbestos fragments, ash / clinker or hydrocarbon odours for separate assessment by an Environmental Consultant;
- That prior to the conduct of any remedial work, a Remedial Method Statement should be approved by the Regulators; and
- That any remedial work conducted on site as part of the proposed development should be certified and documented within a Validation Report produced by an Environmental Consultant.

WM3 Waste Soil Disposal Assessment (4768 22 06 27 Ltr Rpt 01 Rev A EH SP) dated June 2022 by SEC

A WM3 Waste Soil Disposal Assessment was produced by SEC, to help inform appropriate Waste Classification for the disposal of arisings generated associated with the clearance of the chamber identified beneath the former water tower.

The ~2.5m diameter chamber was identified following demolition of the former water tower, which was infilled with soil. The client's initial solution to the chamber involved digging the infill material out and backfilling the chamber however, given the chamber was identified to 13m depth an alternative solution was devised involving capping the chamber with concrete and steels. Prior to this solution however, Made Ground initially removed from the chamber was analysed for a general suite of contaminants including metals, phenols, PAHs, TPH, WAC and asbestos to help inform disposal and risks.

The HazWasteTM Waste Classification Assessment classified the collected Made Ground samples as Non-Hazardous Waste under waste code 17 05 04 and the Made Ground was not considered to pose a risk to receptors if left in situ and capped by concrete.

Based on the findings it was recommended that all waste arisings generated during the cleaning out of the chamber should be segregated disposed of appropriately in accordance with the findings of this report to suitably licensed waste disposal facilities. Additionally, all waste disposal tickets should be retained.

At the time it was decided to cap the chamber only a small volume of Made Ground had been removed for disposal.

Technical Addendum to Remedial Strategy (Ref: 4551 22 07 04 Tech Adden 01 REV A BD SP) dated July 2022 by SEC

A Technical Addendum was produced by SEC, to supplement the original Remedial Strategy (Ref: 4551 22 07 04 Tech Adden Rev A BD SP) in order to document a proposed change to the previously agreed Strategy.

Remedial Excavation -

The Technical Addendum outlined that remedial excavation of the Made Ground to the west of the site be conducted down to proposed formation levels outlined by the Client rather than complete removal of the Made Ground. Areas of soft landscaping were to be excavated to allow for a minimum thickness of 475mm of a certified "clean" cover system, while areas of hardstanding will be excavated to variable depths, dependant on formation levels. Residual Made Ground remaining in areas of shallow excavation associated will be subject to validation testing to document the residual contamination. Potential risks to future site occupants were considered mitigated by the proposed hardstanding and "clean" cover system, which will break human health exposure pathways.

As per the previous Remedial Strategy potential risks to groundworkers / construction workers would be mitigated by the employment of good hygiene standards and future risks to site occupants with regard to impacted Made Ground would be mitigated through the recording of the presence of these materials within

the Site Health and Safety File. This should also detail that if the site layout changes in the future, then an Environmental Consultant should be engaged prior to any proposed changes to consider potential risks and ensure they are managed appropriately.

Protected Trees –

3 No. trees located on site adjacent to the western boundary are subject to Tree Protection Orders and as such excavation within the root protection zones would have to avoid compromising the trees, whilst removing as much impacted Made Ground as possible. As such the following was recommended:

- Conduct of additional site investigation locally to TP03 to better delineate the extent of Made Ground impacted with cement bonded asbestos sheeting fragments, to hopefully rationalise the extent of asbestos remedial excavation required. As previously prescribed in the original Remedial Strategy risks to site investigation personnel should be mitigated by the use of PPE / RPE and dust suppression;
- Production of an Arboricultural Development Report by an Arboricultural Consultant in accordance with BS5837:2012 inclusive of a Tree Survey and Tree Survey Plan, Arboricultural Impact Assessment, Arboricultural Method Statement and Tree Protection Plan;
- Ecological inspection of the trees ahead of pollarding to mitigate potential risks to nesting birds and bats;
- Pollarding of the trees given their size and that the canopy overhangs the position of the proposed houses;
- Careful removal of hardstanding and any sub-base across the western area of the site by a small mechanical excavator with a ditching (toothless) bucket;
- Following removal of hardstanding and sub-base, excavation of soils will be conducted by hand to mitigate damage to tree roots. Where tree roots become too abundant (close to the tree trunks) for hand excavation then impacted Made Ground will remain and the cover system will be “feathered” up to the tree trunks subject to guidance by the Arboricultural Consultant; and
- Future management of the trees will be required.

Excavation to the eastern side of the Site without Environmental Consultant Watching Brief –

Due to the excavation of Made Ground impacted by asbestos fragments up to 0.60m below the original ground level, without an Environmental Consultant's Watching Brief it was recommended that the resulting stockpile of impacted arisings be disposed of as Hazardous Waste (under dual waste code 17 05 04 (soil) and 17 06 05* (cement asbestos fragments). Subject to landfill it may also be possible to dispose of the arisings as Hazardous Waste under 17 05 03*.

The excavated area should be subject to a trial pitting exercise and inspection by a suitably qualified Environmental Consultant to help confirm that the excavation conducted has removed all asbestos cement

bonded fragment impacted Made Ground. Additionally, a representative number of soil validation samples should be analysed for asbestos from across the area of concern.

Ground Gas Risk Assessment Addendum Letter Report (Ref: 4551 22 07 11 Ltr Rpt 01 Rev A AS SP) dated December 2022 by SEC

A Ground Gas Risk Assessment Addendum Report was produced to provide comment on the environmental ground gas monitoring conducted. SEC conducted 9 No. environmental ground gas monitoring visits over the course of approximately 5 No. months including 2 No. visits undertaken at periods of low atmospheric pressure. It was also noted during these visits that the gas leak previously identified within the adjacent manhole was noted to continue throughout the monitoring and olfactory observations of mercaptan were identified within the adjacent manhole. The environmental ground gas monitoring visits conducted identified elevated concentrations of carbon dioxide up to 7.3% by Vol, depleted oxygen levels down to 11.8% by Vol and negligible flow rates up to -0.4l/hr. Methane concentrations were generally low although spikes up to ~45% were recorded. This spike in methane was identified for the first few seconds of monitoring at WS05 and then the methane concentration reduced back down to 0% by Vol.

As a result of these findings and following comments provided by the EHO, SEC conducted a further 3 No. environmental ground gas monitoring visits following a report provided by Southern Gas Networks that the previous gas leak had been fixed. The 3 No. visits conducted identified no elevated concentrations of methane, concentrations of carbon dioxide up to 5.8% by Vol, depleted oxygen levels down to 14.1% by Vol and negligible flow rates up to -0.3l/hr. The concentrations identified across the 11 No. visits provide a ground gas screening value of 0.0292l/hr for the site, which corresponds to Characteristic Situation 1 of current CIRIA C665 guidance.

Based on the combined findings of the environmental ground gas monitoring conducted it was recommended that ground gas protective measures in accordance with Characteristic Situation 2 be implemented on site on a precautionary basis.

Based upon the assumption that the proposed building will comprise a Type A Building as described in the BS 8485:2015 guidance i.e. private housing with small sized rooms, it was recommended that at least 2 No. different design measures be employed within the design of the proposed building in order to reach a minimum gas protection score of 3.5 points. Inclusion of a passively vented sub-floor void and low permeability hydrocarbon resistant gas protection membrane within the design would achieve the required points (however please refer to Tables 5, 6 and 8 of the BS 8485:2015 guidance for further details). All joints and penetrations should be appropriately sealed and that protective measures should be fitted appropriately in accordance with the manufacturer's specification and current guidance including BRE414 and BS8485. The production of the Ground Gas Mitigation and Verification Plan should be conducted by a suitably qualified third body Ground Gas Specialist prior to implementation.

Supplementary Geo-Environmental Site Investigation Report (Ref: 4768 22 09 24 Rpt 02 Rev A AS MT)
dated August 2022 by SEC

Further to the findings of the Preliminary Geo-Environmental Site Investigation Report a supplementary investigation was conducted to better delineate the cement bonded asbestos sheeting fragments identified in the Made Ground at TP03. SEC conducted 9 No. hand dug trial pits (TP03A – TP03I) up to 1.20m bgl to facilitate the collection of soils samples for asbestos analysis and to visually identify the presence of any cement bonded asbestos sheeting fragments.

Soil samples were analysed for asbestos presence / absence and identified no loose fibres within any of the samples analysed from the 9 No. hand pits. Additionally, no further observations of asbestos fragments were noted in the 9 No. hand pits. Therefore, the asbestos impacted Made Ground was considered to affect an area associated locally to TP03 only.

Based on these findings, it was recommended that the asbestos impacted Made Ground be excavated and removed prior to any intrusive groundworks within the vicinity of TP03. Removal of the impacted material was recommended to be conducted under a Watching Brief by a suitably qualified Environmental Consultant. Soil validation samples should be collected and chemically analysed from the sides and base of the resulting remedial excavations in order to certify source removal.

Additionally, any imported backfill material (e.g. engineered fill / aggregate, subsoil or topsoil) should be chemically validated in relation to suitability for use on site as part of the proposed development, including the review of suppliers chemical batch data prior to import and chemical validation samples following importation to site.

3 Remedial Strategy

3.1.0 SPECIFIC REMEDIATION STRATEGY REQUIREMENTS

This section provides further details to specific issues or areas of the proposed development where the remediation strategy should be applied. It is designed to be used as an aid to understanding the remediation specifics for the proposed development and should not be considered in isolation.

3.1.1 SITE WORKS AND OPERATIONAL MATTERS

During the proposed remedial works the site will be well managed, kept secure from public access and the contractor should ensure as a minimum that all works are conducted in accordance with the following;

- Environmental Protection Act, 1990 Part 111 Sections 79-85;
- Environmental Permitting Regulations 2016
- Control of Substances Hazardous to Health Regulations 2002 (COSHH);
- Control of Pollution Act 1974;
- Waste Regulations and Controlled Waste Regulations (WM3 2021);
- Clean Air Act 1993;
- Health and Safety at Work Act 1974;
- The Control of Asbestos in the Air Regulations (SI 556) 1990;
- Control of Asbestos Regulations 2012;
- Construction Design Management Regulations 2015;

The contractor shall achieve compliance with the above by means of the following (which is not intended to be an exhaustive list but rather for indicative purposes):

- Regular damping down / dust suppression especially during warm and sunny weather;
- Deployment of dust screens adjacent to sensitive areas as necessary;
- Conduct of dust monitoring;
- Use of plant exhaust ventilation with filters;
- Employment of odour control measures as necessary;
- Limit vehicle speeds and employ road sweepers as necessary (no dry sweeping);
- Wheel washing prior to vehicles leaving site;
- Sheeting of vehicles carrying waste material away from site;

3.1.2 SITE CLEARANCE

Prior to the completion of demolition of existing structures on site all general waste should be removed and appropriately disposed of from site to suitably licensed waste management facilities. Any associated waste disposal tickets should be retained. Although current ground gas monitoring and the ground gas risk assessment has been concluded, all existing borehole monitoring installations should be afforded careful

protection until the Remedial Strategy is approved. Lost or damaged monitoring installations will need to be replaced.

3.1.3 DISCOVERY STRATEGY

In order to provide a protocol to follow in the event that previously unidentified contamination is encountered on site during the proposed remedial work and preparatory groundwork ahead of construction, a Discovery Strategy should be implemented throughout the work, such as that provided in Appendix B. This should include for the immediate reporting of any suspected contaminated material based on visual and olfactory observations, to an Environmental Consultant for additional separate assessment. Additionally, the Regulators should be informed of any such discoveries as works progress.

3.1.4 GROUNDWATER AND THE CONTROL OF SURFACE WATER RUN OFF

Based on the available data the groundwater beneath the site is in excess of 4.45m bgl and has not been encountered during the previous site investigation. As such no groundwater contamination has been identified on site and potential risks of groundwater contamination associated with the near surface sources of soil contamination identified were also considered to be low. No groundwater remediation was considered necessary and since groundworks (both in relation to soil remediation and foundations) are understood to be shallow it is not considered likely that the groundwater will be encountered during the proposed redevelopment of the site. If however any localised perched groundwater is encountered during the groundwork dewatering may be required. Any dewatering (including surface water management) required should either be discharged to foul sewer under an approved Discharge Consent or to a suitably licensed disposal facility by lorry tanker (disposal documentation to be retained). Chemical testing of water to be removed from site will be required to facilitate a permitted discharge consent or off site disposal.

During the proposed development no unauthorised releases from site are to occur. Therefore effective surface water management should be maintained especially during any heavy rainfall events. To help prevent unauthorised releases from site, surface water runoff management considerations should include;

- Provision of temporary bunds as may be necessary to help prevent runoff from site;
- Use of drip trays / spill kits associated with plant to prevent contamination of surface water: and
- Appropriate off site disposal of any ponded surface water via either foul sewer under an approved discharge consent or by lorry tanker to suitably licensed waste management facilities.

Should soakaways be proposed as part of the drainage solution for the proposed development then they should be appropriately consented by the Environment Agency.

3.1.5 EXISTING TARMAC SURFACING & AREAS OF HARDSTANDING

The existing tarmacked access driveway orientated east to west through the site is potentially coal tar rich given concentrations of Total PAHs and TPH identified within the tarmac. It is to be excavated and removed from site as part of the proposed development. Excavation of the tarmac should be conducted carefully in order to segregate it and any sub-base containing tarmac fragments from other underlying material, for disposal off site to a suitably licensed waste disposal facility. Accordingly the tarmac surfacing and sub-base material should be peeled back to help minimise cross contamination with underlying soils which would increase the volume of material to be removed. To help facilitate waste segregation and validate the ground beneath the access drive following removal of the tarmac rich Made Ground, the removal of the tarmac should be conducted under the watching brief of an Environmental Consultant.

The tarmac and any tarmac containing sub-base material should be disposed of from site as Hazardous Waste under waste code 17 03 01. All waste disposal duty of care documentation should be retained for inclusion within a Validation Report for the site.

In relation to other areas of hardstanding (eg beneath the footprint of former buildings), a watching brief by an Environmental Consultant should also be maintained during the removal of these areas to help confirm an absence of potential previously unidentified contamination. Representative confirmatory validation samples should be collected from the newly exposed ground following the removal of the tarmac drive and any associated sub-base containing tarmac and beneath areas of hardstanding for chemical laboratory analysis to confirm an absence of contaminants of concern including PAHs, hydrocarbons, metals and asbestos. The validation sample results should be compared to LQM/CIEH (Land Quality Management / Chartered Institution of Environmental Health) Suitable Use Levels (S4ULs) for Human Health Risk Assessment 2015 guidance, based on a residential end use with homegrown produce (see Appendix C for Validation Sample Remediation Target Criteria). In relation to asbestos this should be absent. Should soil validation result failures be identified then further remedial excavation and validation analysis will be required.

If any areas of soil contamination are identified beneath the access drive and / or previous buildings then these should be considered in accordance with the Discovery Strategy to determine whether any further investigation and / or remedial action is required to mitigate possible risks.

3.1.6 REMEDIATION OF ASBESTOS IMPACTED MADE GROUND

The Made Ground identified to be impacted with cement bonded asbestos sheeting fragments locally to TP03 (see Appendix A Figure 2) is to be removed from site. Subject to the contractor's preferred method of working this material could either be removed prior to or following the removal of the tarmac access drive and areas of hardstanding. The depth of the asbestos impacted Made Ground locally to TP03 is anticipated to be ~0.90m bgl and it is proposed that this material be excavated prior to other groundwork in this area of the site, to minimise the potential risk of cross contamination. During remedial excavation an asbestos picking exercise to remove the asbestos sheeting fragments should be conducted to pre-treat the material prior to its disposal from site. The extent of remedial excavation should be demarcated by an Environmental Consultant based upon the findings of the Supplementary Geo-Environmental Site Investigation Report (which delineated the extent of impact) and the excavation and asbestos picking should be conducted by Asbestos Awareness trained (Category A & B) operatives under a Watching Brief by an Environmental Consultant.

In order to manage the site operatives Health & Safety during the asbestos hotspot remedial work, all personnel should wear appropriate PPE and RPE including disposable overalls and FFP3 face masks, employ high standards of personal hygiene (ie washing hands, working in well ventilated areas, avoid confined spaces, avoid contact with the soil and not smoking). In addition dust suppression measures should be employed including the use of an airless sprayer and surfactant to prevent the potential generation of dust containing asbestos. It would also be prudent to conduct periodic reassurance asbestos air monitoring by an independent laboratory during the handling of asbestos impacted Made Ground for additional reassurance that the remedial work was not causing the mobilisation of airborne asbestos fibres within any dust created. An onsite threshold provisional threshold of 0.015f/ml should be adopted for the purposes of interpreting asbestos air monitoring results. Should results be recorded in excess of this threshold then activity should immediately be ceased and dust suppression efforts be redoubled until concentrations return to levels below the threshold. Additionally, in accordance with the Joint Industry Working Group (JIWG) risk assessment (see Appendix D) the proposed asbestos remediation should be completed as Non-Notifiable Non-Licensable Work.

Excavated material should be stockpiled on and covered by plastic sheeting pending removal from site for disposal. All recovered fragments of asbestos containing material should be segregated for separate disposal as Hazardous Waste under waste code 17 06 05. The remaining Made Ground following the removal of all asbestos fragments should then be disposed of as Non-Hazardous Waste under waste code 17 05 04. All waste disposal from site should be documented by an Environmental Consultant to help manage waste disposal requirements in accordance with Environment Agency WM3 Guidance (refer to 3.1.7 Appropriate Disposal of Waste Arisings).

The remedial excavation should be validated by a visual inspection of the surrounding ground to confirm an absence of asbestos fragments and by laboratory analysis of soil validation samples collected from the sides and the base of the remedial excavation. Validation samples should be representative of the size of the remedial excavation and given that only limited excavation is anticipated to remove this hotspot a minimum of 5 No. validation samples is required (a sample from each side of the excavation as well as the base of the excavation). The asbestos remediation validation samples should be analysed for asbestos presence / absence analysis and the results should confirm an absence of asbestos.

The asbestos remedial excavation is positioned within an area of proposed landscaping / gardens and as such it should be reinstated in accordance with the remedial strategy for landscaped areas, comprising a "clean" cover system as discussed within 3.1.9 Areas of Proposed Communal Soft Landscaping and Private Gardens.

In relation to the Made Ground identified at TP01 (eastern end of the site) which was impacted by asbestos fragments and was inadvertently excavated previously without the support of an Environmental Consultant, as discussed within the Technical Addendum to the Remedial Strategy an inspection of this area should be conducted by an Environmental Consultant together with the conduct of hand pits providing representative coverage across the affected area and laboratory analysis of recovered soil validation samples to confirm an absence of asbestos within the newly exposed soils. The resulting stockpile of Made Ground containing cement asbestos sheeting fragments that has been created at the eastern end of the site should be disposed of from site as hazardous waste under dual waste code 17 06 05* and 17 05 03*.

3.1.7 EXCAVATION OF LEAD AND PAH IMPACTED MADE GROUND TO ACHIEVE PROPOSED FORMATION LEVELS

As referenced within the Technical Addendum to Remedial Strategy document, it is proposed to reduce site levels between 0.2m and 1.0m below existing levels, which will result in the removal of some of the lead and PAH impacted material (see Appendix A Figure 2 Contamination Layout Plan). Refer to Appendix A Figure 3 for the Proposed Excavation Plan which illustrates the areas of the site which are proposed to be reduced and by how much. Some residual impacted Made Ground will remain in some areas and as such laboratory analysis will be required across these areas of the site following the reduction in levels, to document remaining contaminant concentrations. Risks associated with remaining lead and PAH impacted Made Ground are considered to be mitigated by recording the remaining residual concentrations and by the construction of areas of hardstanding or the placement of a “clean” cover system across garden / landscaped areas. Further remedial excavation to remove any grossly impacted material identified will be subject to findings and validation results of exposed soils at formation level and would be managed in accordance with the Discovery Strategy for the site.

Excavation to reduce site levels will be conducted under a Watching Brief by an Environmental Consultant to help support segregation of arisings for disposal, visually inspect excavation work to help confirm an absence of previously unidentified contamination (eg beneath areas of former hardstanding) and to recover validation samples for laboratory analysis. Soil Validation samples should be collected based upon an approximate 10m grid from across the impacted areas of the site for analysis of the contaminants of concern (speciated PAHs and lead).

Health and safety for site operatives should be mitigated in the same way as the measures discussed above in relation to the remediation of the asbestos hotspot however in relation to general Made Ground, the use of disposable suits and RPE is not necessary and neither is reassurance asbestos air monitoring. General PPE, good hygiene and dust suppression is however required. Furthermore, stockpiles should not be created in excess of 3m height to help reduce potential dust generation.

3.1.8 APPROPRIATE DISPOSAL OF WASTE ARISING

It is not proposed to re-use any arisings on site and as such no work has been conducted to facilitate re-use of waste arisings on site. All arisings generated during remedial work and to facilitate the proposed development are to be disposed of from site to suitably licensed waste disposal facilities.

All waste arisings generated during the construction of the proposed development are to be disposed of from site in compliance with the Environment Agency's Technical Guidance WM3 Version 1.1 dated 2018 titled 'Guidance on the classification and assessment of waste' describes wastes in the List of Wastes Directive (LoWD 2014/955/EU).

Specialist waste classification software (HazWaste™) has been used to help determine waste classification codes for the material encountered on site. Details of the waste classification for the Made Ground and Natural material encountered on site are provided in the Waste Classification Report which is appended to the Sevenoaks Environmental Consultancy Preliminary Geo-Environmental Site Investigation Report (Ref:

4551 22 04 21 Rpt 06 Rev B EH CW). However, a brief summary of the assessment has been provided below:

Made Ground on site has been classified under two separate waste codes 17 05 04 (Non-Hazardous) and 17 03 01* (Hazardous) subject to the concentrations of given contaminants within the Made Ground. Natural material across the site was classified as Non-Hazardous under waste code 17 05 04.

Waste arisings should be segregated and disposed of in accordance with the waste classification table provided below. The Watching Brief by an Environmental Consultant during remedial and preparatory groundwork should help support the appropriate segregation and disposal of impacted waste arisings correctly. Should previously unidentified waste types be encountered then chemical characterisation (including WAC testing) should be carried out prior to disposal to ensure that materials are correctly classified and disposed of appropriately.

Material Type for Reference	Depth Range (bgl)	Landfill Acceptance (WAC Classification)	Waste Classification	Waste Code
Bituminous Surfacing	0.00~0.15m	-	Hazardous	17 03 01
Made Ground impacted with lead and PAHs	0.00~1.35m	Non-Hazardous (due to elevated lead and / or asbestos)	Non-Hazardous	17 05 04
Made Ground impacted with Asbestos Fragments (assuming asbestos containing material fragments are removed prior to disposal from site)	0.45 - ~1.25m	Non-Hazardous (due to elevated metals and / or asbestos)	Non-Hazardous	17 05 04
Cement Bonded Asbestos Fragments	-	-	Hazardous	17 06 05
Made Ground impacted with asbestos fragments	Stockpile at eastern end of site	Hazardous landfill that accepts asbestos waste	Hazardous	17 06 05* / 17 05 03*
General Made Ground	0.00-1.35 m	Non-Hazardous	Non-Hazardous	17 05 04
Natural Material	0.25~4.45m	Non-Hazardous	Non-Hazardous	17 05 04

All waste disposal documentation should be retained for inclusion within a future Validation Report to help demonstrate compliance with waste management requirements and duty of care.

3.1.9 SITE TRAFFIC

Consideration of wheel cleaning facilities should be given throughout the duration of the redevelopment work to prevent debris / mud being tracked off site onto local roads. It may also be necessary to dampen down site soils to prevent dust generation by vehicles accessing the site subject to weather conditions. All wheelwash runoff should be appropriately managed such that unauthorised releases do not occur. Should conditions necessitate, a road sweeper will be employed to supplement the jet washing of vehicles wheels in order to keep the local roads free from mud debris. No dry sweeping is permitted.

Any contaminated water produced as a consequence of these operations will be disposed of in accordance with current best practice and statutory guidance either to foul sewer under a discharge consent and following pre-treatment via a silt buster or via a licensed suction tanker to an approved disposal facility (any waste water disposal tickets should be retained for inclusion within the Validation Report).

Subject to site conditions at the time of the works wheel washing may be required to prevent lorries from tracking site material onto local roads. Should it be necessary to conduct any road sweeping then dry sweeping is to be prohibited. Any wheel wash water should be appropriately managed to prevent unauthorised release from site.

3.1.10 AREAS OF PROPOSED COMMUNAL SOFT LANDSCAPING, PRIVATE GARDENS AND IMPORTED MATERIAL REQUIREMENTS

Areas of proposed soft landscaping and gardens are to be provided with a "clean" cover system comprising the provision of a minimum thickness of 475mm imported material, comprising a minimum of 300mm over topsoil and 175mm of subsoil, laid over a high visibility geotextile marker layer.

Imported topsoil and subsoil that is provided to site should be certified chemically "clean". The supplier's chemical batch data should be provided to an Environmental Consultant for approval prior to delivery of material to site and the cover system should be validated by an Environmental Consultant by means of trial pits to confirm the thickness of imported topsoil and subsoil and laboratory analysis of representative validation samples to corroborate the initial batch supplier data. Soil validation samples should be analysed at a frequency of at least 1 sample per material type per source per landscaped / garden area as a minimum or 1 sample per 50m³ per material per source for larger areas. Validation samples should be recovered for laboratory analysis for a suite of determinands including asbestos, metals, speciated PAHs, organic matter, TPH, phenols and pH. The validation sample results should be compared to the LQM/CIEH Suitable 4 Use Levels (S4ULs) 2015 based upon a residential end use with home grown produce (see Appendix C Remedial Target Values). All imported material delivery tickets should be retained.

Consideration of root protection areas is required in relation to the protected trees situated along the western site boundary. Refer to the Technical Addendum for guidance in this regard in relation to the provision of the cover system and accommodation of the protected trees

SEC is unaware of general material import requirements for the purposes for the redevelopment however any imported material should be chemically certified as suitable for use on site in the same way as imported topsoil / subsoil.

3.1.11 GROUND GAS RISK MITIGATION

Based on the findings of the environmental ground gas monitoring visits conducted, ground gas protection measures in accordance with Characteristic Situation 2 of CIRIA C665 be installed on site within the new properties. This should also include a hydrocarbon vapour resistant membrane as per the Ground Gas / Vapour Mitigation Design. Independent Ground Gas Specialist (Membrane Testing Solutions Ltd) have accordingly produced a Ground Gas / Vapour Mitigation Design and third-party independent inspection, testing and verification plan (see Appendix E) which prescribes the ground gas protection measures, design and validation requirements. A copy of the subsequent Validation Report for the gas protection measures incorporated on site should be appended to the final Validation Report for the site that is required to document all remedial work undertaken during the redevelopment of the site.

3.1.12 WATER SUPPLY PIPE

Potential risks to the potable water supply provided to the new development should be mitigated by the provision of chemically resistant water supply pipe (also known as barrier pipe) within the design of the proposed development. Prior to the installation of chemically resistant water supply pipe on site, the specification for the proposed pipework should be provided to an Environmental Consultant for approval. The installation of the chemically resistant water supply pipework should be documented by an Environmental Consultant and detailed within the future Validation Report for the site. Alternatively, the water supplier should be contacted to clarify their requirements regarding the water supply pipe in light of the site investigation findings, should the possibility of standard pipework use be explored.

3.1.13 HEALTH AND SAFETY FOR SITE OPERATIVES

The groundworks contractor will prepare site specific risk assessment and method statements (RAMS) for approval prior to the commencement of earth works.

All site operatives will be required to wear appropriate PPE including a hard hat, reflective vests, gloves and hard toe footwear. Additionally, workers should employ high standards of personal hygiene (including washing hands before eating) and avoid direct contact with soils (and waters if encountered). Workers should work in well ventilated areas and avoid confined spaces.

In addition to the above, ground contamination risks to workers should be managed during excavation work by the use of appropriate RPE / PPE including disposable suits and FFP3 face masks when working with asbestos impacted Made Ground.

Suitable welfare facilities should be provided on site for the duration of the redevelopment work.

3.1.14 VARIATIONS

As work progresses on site, subject to findings or conditions the remedial strategy may have to adapt to manage unforeseen issues (e.g. in the event that buried infrastructure is encountered which may give rise to

previously unidentified contamination and /or previously unidentified contamination is identified). Any such findings should be assessed in accordance with the Discovery Strategy and any subsequent variations to the remedial strategy should be documented within a Technical Addendum produced by an Environmental Consultant for Regulatory approval.

3.1.15 VALIDATION REPORT

All remedial measures and remedial work implemented on site during the site's redevelopment should be adequately documented within a Validation Report for the site written by an Environmental Consultant, to demonstrate compliance with the remedial strategy for Regulatory approval.

The Validation Report should include information such as a commentary of the works conducted, photos record of work undertaken, validation sample analysis data, details of materials imported to and disposed of from site, and plans indicating remedial work undertaken. Following completion, the Validation Report should be submitted to the Local Authority for approval and discharge of contaminated land conditions.

4.0 General Limitations and Exceptions

1. The advice given in this report with respect to contaminated land / pollution is based on the guidelines available at the time of writing.
2. The Client is advised that the conditions observed on site by SEC at the time of the investigation or assessment are subject to change. Certain indicators of the presence of hazardous substances may have been latent at the time of the most recent site reconnaissance or investigation and they may subsequently have become observable.
3. Comments made relating to land gas or groundwater conditions are based on observations made at the time of the investigation unless otherwise stated. The normal rate of conduct of an exploratory hole does not usually permit the recording of an equilibrium groundwater level for any one strike. Land gas and / or groundwater conditions may vary as a result of seasonal or other effects.
4. Ground contamination often exists as small discrete areas of contamination and there can be no certainty that any or all such areas have been located, sampled and / or identified.
5. The opinions expressed in this report are based on the ground conditions revealed by the site works, together with an assessment of the site and of laboratory test results. Whilst opinions may be expressed relating to sub-soil conditions in parts of the site not investigated, for example between or beyond borehole positions, these are only for guidance only and no liability can be accepted for their accuracy.
6. Whilst commonly regarded as one of the most reliable drilling techniques, cable percussive drilling may result in a certain amount of soil mixing.
7. This assessment may be subject to amendment in light of additional information becoming available.
8. The findings and opinions conveyed in this report are based on information obtained from a variety of sources, including that from 1) previous site investigations and 2) chemical testing laboratories, and which SEC has assumed are correct. Nevertheless, SEC cannot and does not guarantee the authenticity or reliability of the information it has relied upon. SEC can accept no responsibility for inaccuracies within the data supplied by other parties.
9. This report is written in the context of an agreed scope of work between SEC and the Client and should not be used in a different context. In light of additional information becoming available, improved practices and changes in legislation amendment or re-interpretation of the assessment or report in whole or part may be necessary after its original submission.
10. This report is provided for sole use by the Client and is confidential to them. No responsibility whatsoever for the contents of the report will be accepted to anyone other than the Client.
11. SEC believes that providing information about limitations is essential to help the Client identify and thereby manage risks.
12. The copyright of written materials supplied shall remain the property of SEC but with a royalty free perpetual licence, granted to the Client on payment in full of any outstanding monies.
13. SEC does not provide legal advice and the advice of the Clients legal advisors may also be required.
14. SEC notes that this assessment is subject to regulatory review and approval.

15. This report represents a stage in an iterative process of investigation and assessment and as such it is possible that further work may be recommended.
16. The use of data generated by this site investigation for the design of foundations or geo-technical assessment was outside the scope of this report.
17. An arboricultural survey, an ecological survey, an asbestos survey, a geotechnical assessment, a topographical survey, and a flood risk assessment for the site were beyond the scope of this report.
18. This report is subject to the limitations of the original investigations, as reported in the references above.

Appendix A

Figures

Gravesend Borough Council



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 This map is not to be relied upon for accuracy and is for identification purposes only

SITE: Armoury Drive, Gravesend

SCALE: NTS

JOB NO: 4551

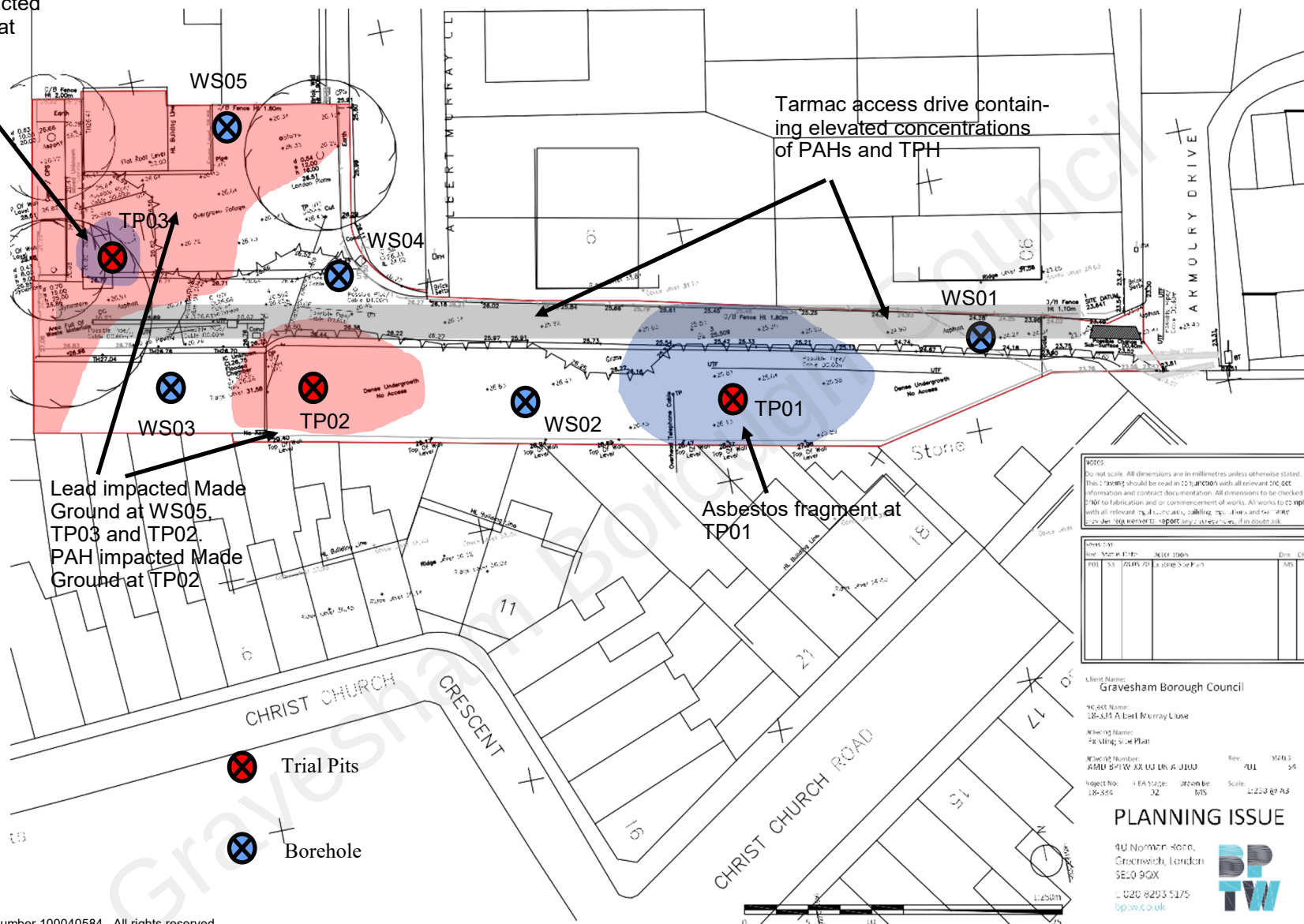
FIGURE TITLE: Proposed Development Layout Plan

REV: 01

FIGURE NO: 01

SEVENOAKS
ENVIRONMENTAL
CONSULTANCY

Asbestos impacted
Made Ground at
TP03



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 This map is not to be relied upon for accuracy and is for identification purposes only

SITE: Armoury Drive, Gravesend

SCALE: NTS

JOB NO: 4551

FIGURE TITLE: Contamination Hotspot Layout Plan

REV: 01

FIGURE NO: 02

SEVENOAKS ENVIRONMENTAL CONSULTANCY



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 This map is not to be relied upon for accuracy and is for identification purposes only

SITE: Armoury Drive, Gravesend

SCALE: NTS

JOB NO: 4551

FIGURE TITLE: Proposed Excavation Plan

REV: 01

FIGURE NO: 03

**SEVENOAKS
 ENVIRONMENTAL
 CONSULTANCY**

Appendix B

Discovery Strategy

Gravesend Borough Council

DISCOVERY STRATEGY CONTAMINATED MATERIALS

SITE: Former St John's Ambulance Station, Armoury Drive, Gravesend

INTRODUCTION

We understand that the site previously comprised part of Gravesend Barracks and was used by St Johns Ambulance as a garage to park their vehicles. In addition a water tower occupied the site. The proposed redevelopment of the site involves the clearance of existing structures and hardstanding to make way for the construction of a 2 No. storey block of flats and 2 No. detached bungalows with communal and private gardens. The site will be undergoing some ground contamination remedial work associated with Made Ground containing cement bonded asbestos sheeting fragments and elevated concentrations of PAHs and lead as discussed within the Remedial Strategy document. A Discovery Strategy is to be implemented on site to provide a protocol to follow in the event that previously unidentified potential ground contamination is encountered during works.

Its purpose is to define the process to be undertaken on site in the event that previously unidentified ground or water contamination or suspicious objects (e.g. cement bonded asbestos sheeting fragments) are discovered during the redevelopment of the site. Should suspected evidence of contamination be identified then work should cease until additional separate assessment has been conducted by an Environmental Consultant. It is intended to be understood and followed by all on-site workers and for all new site workers to be made aware of the procedure.

HOW TO IDENTIFY POTENTIALLY CONTAMINATED MATERIAL

- Looks / colours – e.g black, purple, pink, grey oily or has an iridescent sheen
- Odours / smells – e.g. has an oil, fuel or solvent type of odour
- Man made fragments – e.g. paint or oil tins, cans or drums, car parts, bottles, glass, metal, rubber or rubbish fragments
- Ground contains foreign fragments of cement bonded (potential asbestos) sheeting, coal/coke, clinker, ash
- Subsurface structures / vessels, concrete or metal e.g. oil or asbestos filled pits or tanks, walls, metal pipes and sandbags

(N.B. These are examples only – This list is not exhaustive. If in any doubt then ask)

PROCEDURE

If during the redevelopment work, any visibly contaminated or odourous material is found to be present at the site, it must be investigated further, the Local Planning Authority must be informed immediately of the nature and degree of contamination present and a method statement detailing how the unsuspected contamination shall be dealt with must be prepared and submitted to the Local Planning Authority for approval in writing before being implemented.

On the discovery of any suspicious material or buried structures during the redevelopment of the site, the following procedure should be followed:

- Site Personnel to immediately inform Client / Site Manager. Do not investigate it yourself.
- Client / Site Manager to inspect and confirm the observations of potentially contaminated material and will inform Sevenoaks Environmental Consultancy Ltd. The area will be cordoned off and work will cease in the vicinity.
- Sevenoaks Environmental Consultancy Limited will attend site to inspect and sample the material in question for laboratory testing to evaluate if the material in question has been reported on previously and will attempt to quantify the extent and volume of any potential contamination if not.
- The Environmental Health Officer at the Council will then be notified if the material has not been reported on previously that potentially contaminated material has been discovered and will be forwarded the relevant laboratory data and a remedial strategy for their approval in the event that the material is to be classified as contaminated.

CONTACT DETAILS

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Regulator:

Gravesham Borough Council
Civic Centre,
Windmill Street,
Gravesend,
DA12 1AU

Tel: 01474 337000

Client

Longley Group
Unit 4 Brook Court,
Blakeney Rd,
Beckenham,
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BR3 1HG

Contact: Samuel Parry / Chris Ward

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Email: Samuel.parry@longleygroup.co.uk / christopher.ward@longleygroup.co.uk

DECLARATION

[illegible]

Appendix C

Remedial Target Values

Gravesend Borough Council

Contaminant	Remedial Target Value (mg/kg)	Data Source
PAH (Polycyclic Aromatic Hydrocarbons)		
Acenaphthene	210	LQM/CIEH S4ULS
Acenaphthylene	170	LQM/CIEH S4ULS
Anthracene	2400	LQM/CIEH S4ULS
Benz(a)anthracene	7.2	LQM/CIEH S4ULS
Benzo(a)pyrene (only)	2.2	LQM/CIEH S4ULS
Benzo(b)fluoranthene	2.6	LQM/CIEH S4ULS
Benzo(ghi)perylene	320	LQM/CIEH S4ULS
Benzo(k)fluoranthene	77	LQM/CIEH S4ULS
Chrysene	15	LQM/CIEH S4ULS
Dibenz(ah)anthracene	0.24	LQM/CIEH S4ULS
Fluoranthene	280	LQM/CIEH S4ULS
Fluorene	170	LQM/CIEH S4ULS
Indeno(123-cd)pyrene	27	LQM/CIEH S4ULS
Naphthalene	2.3f	LQM/CIEH S4ULS
Phenanthrene	95	LQM/CIEH S4ULS
Pyrene	620	LQM/CIEH S4ULS
TPH (Total Petroleum Hydrocarbons)		
Aliphatic EC > 5-6	42	LQM/CIEH S4ULS
Aliphatic EC > 6-8	100	LQM/CIEH S4ULS
Aliphatic EC > 8-10	27	LQM/CIEH S4ULS
Aliphatic EC > 10-12	130 (48) ^{vap}	LQM/CIEH S4ULS
Aliphatic EC > 12-16	1100 (24) ^{sol}	LQM/CIEH S4ULS
Aliphatic EC > 16-35	65000 (8.48) ^{f, sol}	LQM/CIEH S4ULS
Aliphatic EC > 35-44	65000 (8.48) ^{f, sol}	LQM/CIEH S4ULS
Aromatic EC > 5-7	370	LQM/CIEH S4ULS
Aromatic EC > 7-8	860	LQM/CIEH S4ULS
Aromatic EC > 8-10	47	LQM/CIEH S4ULS
Aromatic EC > 10-12	250	LQM/CIEH S4ULS
Aromatic EC > 12-16	1800	LQM/CIEH S4ULS
Aromatic EC > 16-21	1900 ^f	LQM/CIEH S4ULS
Aromatic EC > 21-35	1900 ^f	LQM/CIEH S4ULS
Aromatic EC > 35-44	1900 ^f	LQM/CIEH S4ULS
Aliphatic + Aromatic EC > 44-70	1900 ^f	LQM/CIEH S4ULS
Metals		
Arsenic	37	LQM/CIEH S4ULS
Beryllium	1.7	LQM/CIEH S4ULS
Boron	290	LQM/CIEH S4ULS
Cadmium	11	LQM/CIEH S4ULS
Chromium (III)	910	LQM/CIEH S4ULS
Chromium (IV)	6	LQM/CIEH S4ULS
Copper	2400	LQM/CIEH S4ULS
Mercury (elemental)	1.2	LQM/CIEH S4ULS
Mercury (inorganic)	40	LQM/CIEH S4ULS
Nickel	180	LQM/CIEH S4ULS
Phenol (1% OM)	280	LQM/CIEH S4ULS
Phenol (2.5% OM)	550	LQM/CIEH S4ULS
Phenol (6% OM)	1100	LQM/CIEH S4ULS
Selenium	250	LQM/CIEH S4ULS
Zinc	3700	LQM/CIEH S4ULS
Lead	190	C4SL

Appendix D

Joint Industry Working Group Asbestos Risk Assessment

Gravesend Borough Council



Joint Industry Working Group
Asbestos in Soil and Construction & Demolition Materials

Project Reference	4551
Site Name	Former St Johns Ambulance, Armoury Drive
Client	The Longley Group
Run by	BD
Date	05-May-22
Scenario details	Cement bonded asbestos sheeting fragments within Made Ground

Decision Support Tool for CAR2012 Work Categories

Stage 1

Hazard Factors

Select ACM type (run model for each type to generate 'Worst Case' output)
Extent of degradation of ACMs at outset of work
Friability and degree of bonding by matrix (ACM matrix, not ground materials)
Distribution of Visible Asbestos Across Affected Area
Amount of asbestos fibre in selected ACM/fibre type as % of host material

Bonded ACMs: cement, vinyl, composites, textured decorative coatings, bitumen products	1
Intact (Very good condition ACM/ACM fragments	1
Non-friable ACM or ACM with fibres firmly linked in a matrix	0
Occasional/random occurrences of visible contamination by ACMs	1
Low quantities - >0.01 to <0.05 %wt/wt	2

Score

Sub-total

5

Note: the asbestos licensing regime is unaffected by the type of asbestos fibre present in ACMs

Hazard ranking

Very low

No warranty, expressed or implied, or reliance, is provided in relation to the use of this tool.

It is contingent on users to satisfy themselves that the output from the tool is relevant and appropriate to the assessment being made.

Stage 2		
Exposure Factors	Score	
Anticipated airborne fibre concentration - Control Limit or SALI?	<0.001 fibres/ml	0
Anticipated duration of exposure to asbestos	> 2 hours in a 7 day period and Up to 10 hours in a day (e.g. full time occupational exposure)	4
Activity type and effect on deterioration of ACMs during work	Maintenance tasks, no deterioration expected	0
Best description of primary host material matrix (soil/made ground)	Fine Silt and/or Clay	1
Respirable fibre index for ACM - RIVM report 711701034 (2003)	Very low	1
Sub-total		6
Exposure ranking		Low
Combined hazard and exposure ranking	11	Low

Stage 3

Risk Assessment Outputs

Probable Licensing Status	Non-Licensed Work
RPE*	EN149 type FFP3 disposable
Dust Suppression**	Manual/localised dust suppression
Hygiene/Decontamination***	Localised and basic personal decontamination facilities

*Where RPE has to be worn continuously for long periods (e.g. more than 1-hour), then powered RPE may be necessary.

**Reduction in control measures possible if natural mitigation factors are present (e.g. raining, wet ground)

***Guide only; suitability of selected personal hygiene measures may be reviewed on a site/contamination-specific basis

Appendix E

Ground Gas Mitigation Design and Validation Plan

Gravesend Borough Council

GROUND GAS/VAPOUR MITIGATION DESIGN AND 3rd PARTY INDEPENDENT INSPECTION, TESTING & VERIFICATION PLAN:

FOR MATERIALS TO BE INSTALLED AT:

**FORMER ST. JOHN'S AMBULANCE STATION,
ARMOURY DRIVE, GRAVESEND,
KENT, DA12 1NB**

Document Reference No: MTS.DVP.852-BA

Client: Sevenoaks Environmental Consultancy Ltd

Dated: October 2022



Client Name: Sevenoaks Environmental Consultancy Limited

Reference: MTS.DVP.852-BA

Issue: **PRELIMINARY**

Date: 14th October 2022

Approval Status: **FOR APPROVAL**

Prepared by: Barrie Ackroyd

Position: Managing Director

Revisions:

This 3rd party ground gas/vapour mitigation design strategy and verification plan has been prepared by MembraneTestingSolutions Ltd with all reasonable skill, care, and diligence within the terms of the contract with the client, incorporation of our General Terms and Conditions of Business and considering the resources devoted to us by agreement with the client.

We disclaim any responsibility to the client and others in respect of any matters outside the scope of the above.

This 3rd party ground gas/vapour mitigation design strategy and verification plan is confidential to our client and we accept no responsibility of whatsoever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies on this report at its own risk.



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Appendix A – Validation Surveyors/Installer Certificates of Competence

Mr Barrie Ackroyd (MTS Ltd)
Mr Michael Smith (MTS Ltd)
Mr Robert Boosey (MTS Ltd)
Mr Carl Orr (MTS Ltd)

Appendix B – Design Drawings

Sevenoaks Environmental Drawing;

- 4551-03 Rev 01 – Site Location Plan

ADM-BPTW Drawings;

- ADM-BPTW-01-ZZ-DR-A-1701-P02 – 2B4P Flats Floor Plan Layouts
- ADM-BPTW-02-ZZ-DR-A-1702-P04 – 182P Bungalow Floor Plan Layouts

Architectural Design Lab Ltd Drawing;

- DL-SUB-01 Rev -- Substructure Details, Ground Floor – Ground 150mm Below FFL

MTS Ltd Drawings;

- 22852-01 – Typical Perimeter Wall (Un-Ventilated) Gas Mitigation Section Detail
- 22852-02 – Typical Perimeter Wall (Ventilated) Gas Mitigation Section Detail
- 22852-03 – Typical Door Threshold Detail
- 22852-04 – Typical Internal Wall DPC Detail With Under Floor Wall Ventilation
- 22852-05 – Typical Service Pipe Sealing Detail
- 22852-06 – Typical Party Wall Gas Resistant DPC Detail

Appendix C – JUTA Material Specifications

- JUTA GP DPC
- JUTA GP5 Gas Barrier Membrane
- JUTA GP Bitumen Primer
- JUTA GP SAM (Gas Resistant Self-Adhesive Membrane)

Appendix D – Project Survey Sheets

Gas Protection Inspection & Validation Record (Example)
Independent Inspection & Validation - Certificate of Conformance (Example)
CL:Aire Residential Declaration of Conformance (Example)



EXECUTIVE SUMMARY

1. LIMITATIONS

MembraneTestingSolutions Ltd (MTS Ltd) have prepared this 3rd party ground gas/vapour mitigation design strategy and verification plan in accordance with the instructions of Sevenoaks Environmental Consultants Limited (The Client) under the terms of the appointment for the 3rd party ground gas/vapour mitigation system design, installation inspection, testing, validation & reporting.

This 3rd party ground gas/vapour mitigation strategy design and verification plan is limited to the proposed gas/vapour protection measures installed to the new buildings meeting industry and current best practices. MTS Ltd have provided ground gas/vapour mitigation design proposals for this site, therefore professional Indemnity liability is limited to £2M for our gas/vapour mitigation design and validation works and to ensure the specified gas/vapour mitigation measures meet site specific contaminants.

This 3rd party ground gas/vapour mitigation strategy design and verification plan has been prepared in accordance with the information currently received, along with industry best practices and in conjunction with the relevant best practice and guidance documents listed below, of which our MD was a contributor and member of the steering committee for the Ciria C735 publication "Good practice on the testing and verification of protection systems for buildings against hazardous ground gases" (2014). MTS Ltd were also a contributor and part funder on the steering committee for the new CIRIA 795 project, Retrospective Fitting of Gas Protective Measures to Existing Buildings released in December 2020, and CIRIA 801 – Ground Gas - a site managers guide released in December 2021.

We are pleased to advise that our Managing Director Mr Barrie Ackroyd has successfully completed the Validation & Integrity Testing Course provided by the British Geomembrane Association for validation, which is also backed by the CITB. Membrane Testing Solutions Ltd are a member of the British Geomembrane Association and are pleased to advise we are registered with Constructionline, CQMS/SSIP, The Radon Council, The Property Care Association, CL:Aire and we are proud to be a founding member of the British Verification Council (BVC) of which Mr Ackroyd is now Chairperson.

Mr Ackroyd has achieved the Level 3 Assessors Award for the NVQ Level 4 qualification in Validation of Ground Gas Protection Systems, we are also pleased to advise he has successfully achieved CL:Aire accreditation as a Specialist in Gas Protection Validation (SGPV). Our Senior Validation Surveyor Mr Michael Anthony Smith has qualified in the NVQ Level 4 for Verification of Ground Gas Protection Systems (assessed by others) and has achieved CL:Aire TGPV accreditation.



Guidance Reference Documents:

Ground Gas Handbook "NHBC Guidance on evaluation of development proposals on sites where methane and carbon dioxide are present" (2007)
 Ciria C665 "Assessing risks posed by hazardous ground gases to buildings" (2007)
 Ciria C716 "Remediating and mitigating risks from volatile organic compound (VOC) vapours from land affected by contamination" (2012)
 Ciria C735 "Good practice on the testing and verification of protection systems for buildings against hazardous ground gases" (2014)
 Ciria C748 "Guidance on the use of plastic membranes as VOC vapour barriers" (2014)
 BS 8485:2015+A1:2019 "Code of practice for the design of protective measures for methane and carbon dioxide ground gasses for new buildings" (2019)
 Ciria C795 "Retrofitting hazardous ground gas protection measures in existing or refurbished buildings" (2020)
 Ciria C801 "Ground Gas – a site managers guide" (2021)



2. BACKGROUND INFORMATION

MembraneTestingSolutions Ltd (MTS Ltd) were approached by Mr Alistair Stocks of Sevenoaks Environmental Consultancy Ltd via telephone and subsequent email on the 1st September 2022 @ 17:11 having worked with ourselves on numerous projects previously.

The project includes the redevelopment of 6no properties, comprising of a block of 4 terraced properties and 2no detached bungalows.

The site is located at: The Former St. Johns Ambulance Station, Armoury Drive, Gravesend, Kent, DA12 1NB.

Sevenoaks Environmental Consultancy Ltd performed a site investigation on site and also produced a Gas Risk Assessment Addendum letter report which showed a GSV of 0.0292l/hr which corresponds to a CS1 (C665) however given that Carbon Dioxide concentrations were recorded in excess of 5% a precautionary approach was recommended to raise the site characteristic situation 2 (C665).

However, given the site was formerly used as a garage with an above ground tank and also part of a barracks, along with a recent gas pipe leak to the northern part of the site, a hydrocarbon resistant barrier was also recommended to be included within the design of the ground floor slabs.

On the basis of the information received, MTS Ltd provided the client with a quotation for the 3rd party gas/vapour mitigation design using gas/vapour resistant materials for the project, along with a quotation for 3rd party inspection, testing and validation of the installed vapour/gas mitigation measures.

MTS Ltd have subsequently been commissioned by the client to only provide a ground gas/hydrocarbon vapour mitigation design and verification plan for the project but at the current time an order for 3rd party independent validation has not been received.

The following is our gas/vapour mitigation design proposal and verification plan for the gas/vapour protection measures included in the design.

3. GROUND GAS & VAPOUR RISK ASSESSMENT

MTS Ltd received an addendum letter report performed by Sevenoaks Environmental Consultancy Ltd for the site which is as follows;

- Ground Gas Risk Assessment Addendum Letter Report, Ref: 4551 22 07 11 Ltr Rpt 01 rev A AS SP dated 11th July 2022

Below is a precis of the contents of this addendum letter;



145a Hastings Road
Pembury
Tunbridge Wells
Kent, TN2 4JU

Tel: 01892 822 999

www.sevenoaksenvironmental.co.uk
enquiries@sevenoaksenvironmental.co.uk



Samuel Parry,
The Longley Group,
Unit 4 Brook Court,
Blakeney Road,
Beckenham,
Kent,
BR3 1HG

11th July 2022

Our Ref: 4551 22 07 11 Ltr Rpt 01 Rev A AS SP

Dear Samuel,

SITE: Armoury Drive, Gravesend, DA12 1NB
SERVICE: Ground Gas Risk Assessment Addendum Letter Report

Introduction

The work covered in this report was undertaken on behalf of The Longley Group, in accordance with Sevenoaks Environmental Consultancy Ltd's (SEC) proposal dated January 2022 (Ref: 4551 22 01 05 Ltr 01 FPA 01 REV A LB CW). This addendum provides comment on the environmental ground gas monitoring carried out as part of the previous site investigation and should be read in conjunction with the Preliminary Geo-Environmental Site Investigation Report (Ref: 4551 22 04 21 Rpt 06 Rev B EH CW) previously provided.

The site was noted to form an approximately 'L' shaped plot previously occupied by a former St John's Ambulance Garage and a Water Tower Structure with associated tarmac hardstanding (See attached Figures 1 & 2 – Site Location Plan and Existing Site layout Plan). The approved proposed development associated with the planning application (Ref: 2020/0561) is understood to involve the construction of 1 No. 2-storey block of flats to the western end of the site and 2No. detached bungalows to the eastern end with gardens and areas of soft landscaping (see attached Figure 3 – Proposed Development Plan).

As part of the Geo-Environmental Site Investigation referred to above, SEC were instructed to carry out 9no. environmental ground gasses and groundwater monitoring visits. Details of the standpipes installed and their response zone backfill / materials have been provided in the relevant attached Exploratory Hole Records. Also see attached the Exploratory Hole Location Plan.

Assessment

9 No. rounds of environmental ground gas monitoring was carried out between 9th March 2022 and 7th July 2022 and included 2no. rounds of monitoring undertaken at periods of low atmospheric pressure to help inform a preliminary ground gas risk assessment given consideration of the potential on site sources of ground gas that have been identified which include the following:



- Made Ground associated with the sites former use as a garage and its potential use for storage and leaks of oils/paints/fuels and identified to contain elevated concentrations of PAHs;
- Former site use as a garage with an above ground tank and as part of a barracks;

Off-site sources of potential contamination identified primarily included an infilled chalk pit ~167m north east (1954 – 1981), tanks 76m north east (1954 – 1993) and 49m south east (1954 – 1978)

Based on the rounds of monitoring conducted, concentrations of carbon dioxide were recorded to be typically below 5% although the highest concentration recorded was 7.3% by Vol (WS05). Methane concentrations were generally low although spikes up to ~45% (WS05 monitoring round No. 5) were recorded. This spike in methane was identified for the first few seconds of monitoring at WS05 and then the methane concentration reduced back down to 0% by Vol. During the other visits concentrations of Methane were not recorded to be elevated, except for visit No. 6 where another methane spike was recorded for a few seconds before returning to 0% by Vol. No elevated concentrations of VOCs were recorded and flow rates were recorded up to a maximum of 0.4l/hr (WS01 and WS05) (see attached Environmental Monitoring data).

Of potential relevance it is known that a gas main leak occurred nearby to the north of the site, which was reportedly repaired in the early part of 2022. However during the environmental ground gas monitoring visits and also prior to the conduct of the previous Site Investigation (which was after the reported repair was made) a strong methane odour has been observed within the manhole located adjacent to the north of the site in Albert Murray Close which is also incidentally close by to WS05.

Discussion and Recommendations

The results of the environmental ground gas monitoring indicate that a ground gas screening value of 0.0292 l/hr is applicable to the site. This corresponds with Characteristic Situation 1 of the current CIRIA C665 guidance. However, given that carbon dioxide concentrations have been recorded in excess of 5%, spikes of highly elevated methane have been recorded on site and the apparently persistent methane which continues to collect within a manhole adjacent to the site possibly associated with the gas main leak adjacent to the north of the site, it is recommended that a precautionary approach be adopted with respect to potential ground gas risks on site. Accordingly it is recommended that Characteristic Situation 2 of CIRIA C665 Guidance should be adopted for the site.

Based upon the assumption that the proposed building will comprise a Type A Building as described in the BS 8485:2015 guidance i.e. private housing with small sized rooms, it is recommended that at least 2 No. different design measures be employed within the design of the proposed building in order to reach a minimum gas protection score of 3.5 points. Inclusion of a passively vented sub-floor void and low permeability hydrocarbon resistant gas protection membrane within the design would achieve the required points (however please refer to Tables 5, 6 and 8 of the BS 8485:2015 guidance for



further details). Please note that all joints and penetrations should be appropriately sealed and that protective measures should be fitted appropriately in accordance with the manufacturer's specification and current guidance including BRE414 and BS8485.

At an early design stage prior to construction a Verification Plan detailing the gas protection materials' specifications, methodology of installation, installation design and the installers qualifications and experience should be produced by a suitably qualified independent specialist for submission to the Regulators for their approval prior to installation of the protection measures to avoid proceeding at risk. A suitably qualified independent specialist should also produce a Validation Report in accordance with C735 for the membrane installation to certify the installation of the protective measures complies with the requirements of the Verification Plan.

It is recommended that the existing monitoring boreholes should be retained until the ground gas risk assessment has been approved by the Regulators.

Potential residual risks should be mitigated by the implementation of a Discovery Strategy on site during the redevelopment works which should include for the immediate reporting of any potential indicators of ground or water contamination (e.g. cement bonded asbestos sheeting fragments, ash/clinker or hydrocarbon odours) for additional separate assessment by an Environmental Consultant. Additionally groundworkers should wear appropriate PPE/RPE, work in well ventilated areas, avoid confined spaces, avoid contact with soil and groundwater, not smoke, adopt high standards of personal hygiene, and operate with due care.

It is also noted that the recommendations made in the previous Geo-Environmental Site Investigation report remain applicable and are reiterated below for reference;

- That prior to the proposed development, all general rubbish and drums of fuel should be appropriately removed from site and disposed of at suitably licensed facilities (all waste disposal documents to be retained);
- That the existing potentially coal tar rich tarmac surfacing be disposed of from site to suitably licensed waste management facilities as hazardous waste under waste code 17 03 01. All waste disposal documentation should be retained for inclusion within a future Validation Report. To help facilitate appropriate waste disposal from site, the tarmac surfacing should be carefully excavated and segregated from the underlying material under the supervision of an Environmental Consultant;
- That a watching brief be maintained by an Environmental Consultant during the removal of the hardstanding across the site and in particular the ground slab of the former buildings. Confirmatory validation samples should be recovered for analysis to confirm an absence of impact associated with contaminants of concern including metals, PAHs, hydrocarbons and asbestos;
- That remedial excavation be conducted to remove the lead and asbestos impacted Made Ground identified on site for appropriate disposal to suitably licensed facilities. Remedial excavation should be overseen by an Environmental Consultant and be certified by soil validation sample analysis from the sides and base of the remedial excavation. Any imported backfill material (e.g. engineered fill / aggregate, subsoil or topsoil) should be chemically validated in relation to suitability for use on site as part of the proposed development, including the review of the supplier's chemical batch data prior to import and chemical analysis of validation samples following importation to site;



- That an asbestos picking exercise be conducted during the excavation of asbestos impacted material locally to TP01 and TP03, to remove fragments of cement bonded asbestos sheeting for separate disposal. Asbestos picking should be conducted by Category A & B Asbestos Awareness trained operatives and to help mitigate potential Health and Safety risks appropriate PPE / RPE should be worn by operatives during the remedial excavation and asbestos picking, including disposable suits and RPE;
- That all waste arisings should be disposed of from site appropriately in accordance with EA WM3 guidance. The impacted Made Ground should be disposed of as Non-Hazardous waste under waste code 17 05 04 and picked asbestos containing material fragments as Hazardous waste under waste code 17 06 05. All arisings should be segregated based on waste stream types and according to waste classification. All waste disposal tickets should be retained;
- That a “clean” cover system be provided to a minimum thickness of 475mm across landscaped / garden areas. The cover system should comprise the provision of a high visibility marker layer (permeable geotextile or similar) overlain by imported certified “clean” topsoil to the required minimum thickness. Subject to existing and proposed site levels it may be necessary to remove some existing soils to facilitate the cover system. Prior to delivery of any imported topsoil to site, the supplier’s chemical batch data should be provided to an Environmental Consultant for review and following provision of the cover system to landscaped areas it should be validated by an Environmental Consultant. This should include chemical analysis of a representative number of imported cover system validation samples based on a minimum frequency of 1 validation sample per garden / landscaped area as a minimum or 1 sample per 50m³ per material source for larger areas. In addition the thickness of cover system should be certified;
- That the water supply pipework included within the design of the proposed development should be chemically resistant barrier pipe. Alternatively the water supplier should be contacted to confirm chemically resistant barrier pipe is not required;
- That groundworkers should wear appropriate PPE/RPE, work in well ventilated areas, avoid confined spaces, avoid contact with soil and groundwater, not smoke, adopt high standards of personal hygiene, and operate with due care;
- That a Discovery Strategy should be implemented on site during the redevelopment work which should include for the immediate reporting of any potential indicators of ground or water contamination e.g. asbestos fragments, ash / clinker or hydrocarbon odours for separate assessment by an Environmental Consultant;
- That prior to the conduct of any remedial work, a Remedial Method Statement should be approved by the Regulators; and
- That any remedial work conducted on site as part of the proposed development should be certified and documented within a Validation Report produced by an Environmental Consultant.



Kind Regards

Damian Jones
Managing Director
d.jones@sevenoaksenvironmental.co.uk

Enc.

Site Location Plan
Existing Site Layout Plan
Proposed Site Layout
Exploratory Hole Location Plan
Exploratory Hole Records
Environmental Monitoring
General Limitations and Exceptions

End of Precis Text

In accordance with the above, MTS Ltd have developed this ground gas/vapour mitigation measures design and verification plan based on the low levels of ground gas and flow rates, but to also include hydrocarbon vapour protection in line with the CIRIA C716 and C748 best practice documents.

4. BS 8485:2015+A1:2019 COMPLIANCE

Using the tabled contents of the BS 8485:2015+A1:2019 document, along with the CS2 'Low Risk' site classification, we are able to calculate the above points score for the ground gas mitigation measures, which is achieved by the following:

Table 3, Building Type	Table 4, Gas Protection Score by CS and Type of Building	Table 5, Gas Protection Scores for the Structural Barrier	Table 6, Gas Protection Scores for Ventilation Protection Measures	Table 7, Gas Protection Score for the Gas Resistant Membrane
Type 'A' Private	CS2 + Type A = 3.5 Points Required	Suspended Slab I.E Beam and Block Slab = 0 Points	Passive ventilation of the underfloor void to 'Good Performance' = 1.5 Points	Gas membrane installed and validated in accordance with CIRIA C735 = 2.0 Points

Total 'MINIMUM' Points Score from the above = (T6 = 1.5 + T7 = 2.0) = **3.5 Points Achieved**, which meets the requirements of the BS 8485:2015+A1:2019 document.

However, the BS 8485:2015+A1:2019 should not be used to calculate a points score for hydrocarbon vapour mitigation design measures as this document is only for Carbon Dioxide and Methane, as is noted in the following precis text;



Annex H (informative) Volatile organic compounds (VOCs)

H.1 General

This British Standard does not consider the risks associated with VOC gases, primarily as the methods of measurement and risk assessment do not fully align with those for other ground gases (see BS 8576). However, as there are similarities in the methodology for mitigation of the effects of VOCs entering indoor or ambient air spaces, this annex is included to give the reader a background to the subject and to suggest further reading.

Therefore, our design includes for a proprietary gas and vapour resistant membrane to be placed across the complete footprint of the properties, of fully welded and tested seam construction. Gas and vapour resistant DPC's will be installed using hot air hand welding seaming techniques, with detailing provided using gas resistant self-adhesive tape joints around corner/door reveal detailing and service pipes.

5. DESIGN DRAWINGS

MTS Ltd received drawings inclusive of proposed ground floor plans and section details for the project. MTS Ltd have also produced a number of ground gas/vapour mitigation drawings for this site, which will enable all parties to understand how the vapour mitigation measures are to be remediated and how to install the specified products.

Copies of the drawings noted below are appended in Appendix. B of this report.

Sevenoaks Environmental Drawing:

- 4551-03 Rev 01 – Site Location Plan

ADM-BPTW Drawings:

- ADM-BPTW-01-ZZ-DR-A-1701-P02 – 2B4P Flats Floor Plan Layouts
- ADM-BPTW-02-ZZ-DR-A-1702-P04 – 182P Bungalow Floor Plan Layouts

Architectural Design Lab Ltd Drawing:

- DL-SUB-01 Rev - - Substructure Details, Ground Floor – Ground 150mm Below FFL

MTS Ltd Drawings:

- 22852-01 – Typical Perimeter Wall (Un-Ventilated) Gas Mitigation Section Detail
- 22852-02 – Typical Perimeter Wall (Ventilated) Gas Mitigation Section Detail
- 22852-03 – Typical Door Threshold Detail
- 22852-04 – Typical Internal Wall DPC Detail With Under Floor Wall Ventilation
- 22852-05 – Typical Service Pipe Sealing Detail
- 22852-06 – Typical Party Wall Gas Resistant DPC Detail

6. MATERIAL SPECIFICATIONS

MTS Ltd take pride in specifying the very best in material performance and value for money. Therefore in this instance, we have specified JUTA UK Ltd products which we consider to be a primary membrane manufacturer in the UK.



JUTA perform full materials testing on all of their products with all test results being made available for review if required. Therefore, we have extreme confidence in their products, and in this instance we have specified the most appropriate material specifications, which also offer robustness of the materials to withstand the construction process and remain serviceable for the lifetime of the building design.

Therefore, the recommended materials are to be supplied by the following manufacturer:

JUTA UK Limited
Melton Grove Works
Blackpool Road
Lytham
FY8 5PL

Tel: 01772 754 177
Contact: Mr Patrick Flood
Email: info@juta.co.uk
Web: www.juta.co.uk

The proposed gas/vapour resistant materials for this project are as follows;

- JUTA GP DPC
- JUTA GP5 Gas Barrier Membrane
- JUTA GP Bitumen Primer
- JUTA GP SAM (Gas Resistant Self-Adhesive Membrane)

The above Material Specifications may be found appended in Appendix. C of this report.

We have not allowed for any tapes for jointing of the above products as hydrocarbon vapour membranes should be heat welded where possible. Butyl double sided jointing tapes may be affected by hydrocarbon vapours/solvents; therefore we have recommended welded joints where possible.

As the gas resistant materials are to include for hydrocarbon resistance, these materials should be installed by NVQ level 2 qualified operatives who employ twin seam and hot air hand welding seaming techniques, which is in accordance with the CIRIA C716, C735 & C748 best practice documents.

7. MEMBRANE INSTALLATION CONTRACTORS

MTS Ltd confirm as the project includes for gas and vapour resistant membranes, these material types should be installed by specialist NVQ Level 2 qualified gas membrane installation operatives, or at least overseen by someone who holds his qualification, which is in accordance with the CIRIA C716, C735, C748 & BS 8485:2015+A1:2019 best practice documents.

The relevant qualification for gas membrane installations is as follows;

Cskills Awards L2 NVQ Diploma in sub-structure work occupations (construction) – Installation of gas membranes:
<http://tinyurl.com/lj8w7ay>

MTS Ltd would recommend client employs specialist NVQ qualified operatives, and we offer a list of very competent installation companies below;



GB Lining Services Limited
195 Witham Road
Black Notley
Braintree
Essex
CM77 8ND

Contact: Mr Brett Bowles
Tel: 01376 551 022
Mobile: 07864 701 359
Email: brettbowlesgbliningltd@btinternet.com

MB Membranes Ltd
7 Cecil Court
Harlow
Essex
CM18 7QR

Contact: Mr Neil McNamara
Tel: 01279 444 300
Email: neil@mbmembranes.co.uk

Prestige Air Technology Limited
Landews Meadow
Green Lane
Challock
Ashford
Kent
TN25 4BL

Contact: Mr Andy Collins
Tel: 01233 740 844
Email: andy@prestigeair.com

MTS Ltd have validated these companies' workmanship on numerous occasions and consider them all to be premier specialist installers within the UK. They all also employ fully welded seaming techniques where ever able whereby reducing the potential failure of butyl taped joints.

8. PROPOSED GAS/VAPOUR MITIGATION DESIGN

The proposed ground gas/vapour mitigation measures for the site will include the following:

1. The ground floor slabs are to be constructed using a concrete beam and block system with a minimum 150mm ventilated void below. Periscopic airbricks will be installed on opposing sides of each property and at the maximum distance of 3m centres and no more that 450mm from the corners. Any internal underfloor obstructive walls with have openings left within the walls to allow for free and unhindered air flow through the complete underfloor void and decompartmentalising any otherwise unventilated floor areas. This system will provide a passive ventilation system of 'Good Performance' whereby meeting a minimum points score of 1.5 as defined by Table 6 of the BS 8485:2015+A1:2019 best practice document.
2. It is assumed the method of construction will be perimeter and infill whereby the gas/vapour resistant DPC's will be installed to the perimeter and internal walls/party walls and left laying on the beam and block floor



- slab by 150mm to connect onto at a later date. All membrane seams to be welded wherever possible corner seams overlain with gas resistant self-adhesive membrane.
3. Any service pipes that are close to walls are to be completed at the DPC stage to ensure the detailing is maintained as easy as possible.
 4. The properties are then constructed and made watertight. The gas/vapour membrane is to be installed to each property internal areas immediately prior to insulation and screed.
 5. The existing beam and block floor slabs are to be thoroughly cleans and any dips, hollows filled and any sharp protrusions removed.
 6. A proprietary and high-performance gas/hydrocarbon vapour barrier membrane is to be installed above the beam and block floor slabs, which will cover the entire internal room footprint of each property. The Juta GP5 gas membrane will be welded together and also to the existing GP DPC laying on the floor.
 7. Any damage on the GP DPC will be repaired using welded patches of parent DPC membrane or using patches of GP SAM extending 50mm in all directions from the extent of any damage.
 8. Any service pipe entries are to be sealed using JUTA GP SAM 150mm up the service pipe and 150mm onto the JUTA gas/vapour resistant membrane.
 9. At door threshold the GP5 membrane is to be taken up the perimeter masonry and terminates on top of the external masonry.
 10. Any holes in the gas/vapour membrane must be repaired using the parent membrane with welding seaming actions or patches of GP SAM.
 11. The gas/vapour resistant DPC's and membranes are to be validated once the membrane installation has been completed, where the whole installation is to be offered for validation and without any operatives being admitted into the property until validation/testing has taken place.
 12. Upon completion and sign off by the validation surveyor, the membrane must be cordoned off and only ongoing floor finishes installation operations are permitted above the unprotected materials. All foot traffic is to be kept off the exposed membrane. Or: The gas/vapour membrane is protected using approved walkways reducing foot traffic during insulation installation operations.
 13. A final sign off validation report will be produced at the end of the installation process and submitted to the local authority for clearing planning conditions pertaining to gas/vapour contamination.

9. PROPOSED INSPECTION, TESTING AND VALIDATION REGIME

It is proposed the installed gas/vapour protective materials installed are to be 3rd party independently inspected, tested and validated in accordance with the Ciria C735 best practice document by a competent and qualified validation surveying company, namely Membrane Testing Solutions Ltd.

Due to the perceived moderate gas/vapour risk associated with the site but with installation of vapour mitigation measures by NVQ Level 2 specialist installation operatives, installed above the beam and block floor slabs it is proposed to apply a 'Reduced Level' of validation processes on this project.

All aspects of the vapour mitigation measures will be checked and validated in some manner, inclusive of specialist membrane installation and 3rd party inspection, testing and validating the gas/vapour membrane inclusive of checking service pipe sealings and the like.

We have allowed for up to 4no site validation visits to validate the gas/vapour membranes in the following manner:

- The surveyor will mark up a drawing with the position and numbers of periscopic air bricks on a layout drawing and ensure compliance with the 3m maximum centres design criteria. Whilst on site we will also inspect the void depth below the beam and block floor to ensure compliance with the minimum 150mm void depth.
- We have allowed for 2no site visits to inspect test and validate the GP DPC's to the 6no properties which we consider appropriate for the detailing to be installed on site and in the following manner;
- 1no visit for plots 1-4 and 1no visit for plots 5 & 6 inclusive.



- Upon completion of the construction process and all 6no plots are watertight, the gas mitigation measures will be installed to plot 1-4 which will be validated over 1no visit, with the two bungalows (plots 5 & 6) being validated over the final and 4th visits (or Visa Versa dependant on client build programme).
- It is proposed MTS Ltd employ a detailed visual inspection and seam pick probe testing to 100% of site seams, in line with ASTM D4437-2018 test method.
- QA certification and record of vapour mitigation measure forms will be completed and submitted to the client for confirmation of validation pass of which these documents will be included within our final sign off validation report.
- Produce a final sign off validation report along with inclusion of installers QA documentation and photographic evidence taken by MTS Ltd on site, to further include 1no CL:Aire Residential Declaration of Conformity certificate to include for all 6no plots on site.

MTS Ltd consider the above proposed site visits will provide what is considered sufficient inspection, testing and validation practices to ensure that the gas/vapour mitigation measures are installed in accordance with the design, material specifications and industry best practices.

No membranes will be validated and signed off by MTS Ltd until a minimum acceptable standard has been achieved, whereby ensuring the membrane installation is suitably managed to achieve maximum confidence to the suitability of the installed materials.

Should any site inspections prove to be unacceptable and prove such on a continual basis, MTS Ltd reserve the right to increase our site inspection validation visit numbers, to ensure that the installed materials are sufficiently managed ensuring the materials are fit for purpose and future occupant's health and safety is maintained.

9.1 INSPECTION, VALIDATION & TESTING METHOD STATEMENT

1. The Validation Surveyor will be suitably experienced and qualified to carry out a detailed visual inspection and seam integrity testing of the installed gas/vapour membrane system.
2. All membrane areas will be subject to independent, inspection validation and seam integrity testing.
3. The Validation Surveyor will visually inspect 100% of the installed gas/vapour protection measures to the areas submitted for inspection.
4. Seam pick testing will be performed to 100% of all site seams provided for inspection, inclusive of service pipe seals and welded/taped joints etc. ensuring all seams are suitably bonded/adhered. Seam pick testing comprises of a hand-held implement with a wooden handle and 6mm diameter x 250mm long shaft terminating in a point at 90° to the main shaft. The point of the seam pick test is drawn down the length of the seam seeking intrusion of the implement into the seam whereby indicating a defect. This testing method is also used for difficult detailing or intricate works such as around pipe sealing details etc. This test method also complies to the ASTM D4437 2018 test criteria.
5. Any faults/rips/tears/punctures or un-bonded seams will be "number marked" and recorded for repair on a defect position plan. Repair methods will be agreed with the installation contractor.
6. All repairs will be re-inspected for suitability, with photographic evidence given in the final report provided at the end of the contract.
7. Upon completion of the test and re-test of any subsequent repairs found, the gas/vapour membrane area will be signed off and certified as integral.
8. The Validation Surveyor will complete a "Independent Inspection & Validation Certificate of Conformance" for each plot and photographic evidence will be taken. The project survey sheets and photographic logs will be incorporated in the final report submission.
9. Upon completion of the validation/integrity test inspection, a validation certificate stating the outcome of the inspection whether being a pass or fail will be issued. When the inspection test shows a pass, the membrane should be immediately protected using the manufacturers recommended system, otherwise follow-on construction works are suitably risk assessed to ensure the geomembrane remains intact and undamaged during the construction phase. Should the inspection outcome prove a failure, the failure points are to be remediated in the agreed manner and re-inspected by the Validation Surveyor at a future agreed date/time.



The Validation Surveyor Will:

- Perform all visual detailed and intimate Inspections:
- Perform seam testing to 100% of site seams:
- Mark and identify any repairs required:
- Re-inspect and re-test the repairs:
- Complete the project survey sheets:
- Take photographs for inclusion in the final validation report:
- Produce a final validation report at the end of the installation process, to include 1no CL:Aire Residential Declaration of Conformance for the 6no plots.

10. CONCLUSIONS AND RECOMMENDATIONS

As a result of our proposed 3rd party independent inspection, testing & validation process, MTS Ltd conclude the gas/vapour mitigation measures prescribed for this site will be inspected, tested and validated in accordance with the MTS Ltd proposed gas/vapour mitigation design, materials specifications and industry best practice installation requirements.

Therefore, MTS Ltd believe the proposed gas/vapour mitigation measures prescribed for this project will be sufficiently managed to maintain maximum confidence to the proficiency of the installed mitigation system, therefore we conclude that the materials installed on this project will ultimately be appropriate to the 'Moderate Vapour Risk' and will be "validated in accordance with the CIRIA C735" best practice document.

As such, it is Membrane Testing Solutions Ltd recommendation to the Local Authority/Project Stakeholders to sign off this gas/vapour mitigation design and verification plan as;

"APPROVED FOR CONSTRUCTION"

END OF REPORT

11. APPENDICES

Appendix A – Validation Surveyors/Installer Certificates of Competence

Mr Barrie Ackroyd (MTS Ltd)
Mr Michael Smith (MTS Ltd)
Mr Robert Boosey (MTS Ltd)
Mr Carl Orr (MTS Ltd)

Appendix B – Design Drawings

Sevenoaks Environmental Drawing;

- 4551-03 Rev 01 – Site Location Plan

ADM-BPTW Drawings;

- ADM-BPTW-01-ZZ-DR-A-1701-P02 – 2B4P Flats Floor Plan Layouts
- ADM-BPTW-02-ZZ-DR-A-1702-P04 – 182P Bungalow Floor Plan Layouts



Architectural Design Lab Ltd Drawing:

- DL-SUB-01 Rev - - Substructure Details, Ground Floor – Ground 150mm Below FFL

MTS Ltd Drawings:

- 22852-01 – Typical Perimeter Wall (Un-Ventilated) Gas Mitigation Section Detail
- 22852-02 – Typical Perimeter Wall (Ventilated) Gas Mitigation Section Detail
- 22852-03 – Typical Door Threshold Detail
- 22852-04 – Typical Internal Wall DPC Detail With Under Floor Wall Ventilation
- 22852-05 – Typical Service Pipe Sealing Detail
- 22852-06 – Typical Party Wall Gas Resistant DPC Detail

Appendix C – JUTA Material Specifications

- JUTA GP DPC
- JUTA GP5 Gas Barrier Membrane
- JUTA GP Bitumen Primer
- JUTA GP SAM (Gas Resistant Self-Adhesive Membrane)

Appendix D – Project Survey Sheets

Gas Protection Inspection & Validation Record (Example)

Independent Inspection & Validation - Certificate of Conformance (Example)

CL:Aire Residential Declaration of Conformance (Example)



APPENDIX A

Validation Surveyors Certificates of Competence



This is to certify that

Barrie Ackroyd

Has successfully attended a
Technical Course
in

Gas Membrane Installations

This in support of the Quality Controls
Of Inspection and Validation
Of Gas Membrane Installations

This certificate is awarded by:



Date: 30/10/14



Gas Membrane Installation Technical Course for Inspectors & Validators

Training Modules Attended

Practical & Knowledge

- Components of Gas Protection Systems with Venting
- Verification
- Gas Membrane Installation Techniques
- Introduction to Integrity Testing (Practical)
- Introduction to Integrity Testing (Theory)
- Risk Assessment and Validation Plan
- Site Inspections and Pro-formas
- Validation Report
- On Site Assessment

CERTIFICATE of ACCREDITATION

This is to certify that

Barrie Ackroyd

has been awarded the following accreditation

Gas Protection Verification Scheme (GPVS)
Specialist (SGPV)

Certificate No.: 435qQb4axS

Issued: 19 November 2020

Valid for 4 years from the above date



Richard Froggatt
CL:AIRE Chairman



Certificate of Achievement

(Full Award)

This is to certify that

Michael Anthony Smith

has been assessed as meeting the required level of competence for all
the units necessary to achieve the full award

**ABBE Level 4 NVQ Diploma in Verification of Ground Gas Protection
Systems**

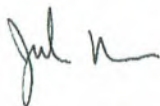
603/3266/9

Units achieved:

Mandatory Units

K/617/0687, M/617/0688, K/617/0690, M/617/0691,
A/617/0693, F/617/0694, J/617/0695

Signed :



Professor Julian Beer, Chair of ABBE Board

Date:

23/01/2020

Candidate Registration No : 0000036770 Certificate Issue No : 142188

ofqual
REGULATED
register.ofqual.gov.uk



00026189

Certificate of Unit Achievement

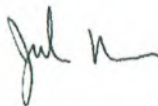
This is to certify that

Michael Anthony Smith

has been assessed as meeting the following units of competence
which form part of an accredited qualification

K/617/0687	Design Principles and Application for Construction in the Built Environment
M/617/0688	Materials for Construction in the Built Environment
K/617/0690	Health, Safety and Welfare in the Construction Environment
M/617/0691	Principles of Construction and Maintenance of Buildings
A/617/0693	Confirming Work Meets Quality Standards in the Workplace
F/617/0694	Verification and Inspection of Ground Gas Protection Systems
J/617/0695	Principles of Regulatory Control Procedures and Legislation

Signed :



Professor Julian Beer, Chair of ABBE Board

Date:

23/01/2020

Candidate Registration No : 0000036770 Certificate Issue No : 142185



00026186

CERTIFICATE of ACCREDITATION

This is to certify that

Michael Smith

has been awarded the following accreditation

Gas Protection Verification Scheme (GPVS)
Technician (TGPV)

Certificate No.: 2UEiQm05Uq

Issued: 8 April 2021
Valid for 4 years from the above date



Richard Froggatt
CL:AIRE Chairman



Certificate of Attendance

Continuing Professional Development

This is to certify that

Robert Boosey

Has attended and passed the course
Verification of Gas Protection Systems

on

26th February 2019

at

Doncaster Membrane Installations Limited, Adwick
Park, Manvers, S63 5AB

Contact time: 6.5 hours

Trainers: Michael Corban & Gordon Cave:



Richard Froggatt, CL:AIRE Chairman

CL:AIRE

Registered address: 32 Bloomsbury Street, London, WC1B 3QJ
Telephone: +44 (0)2072 964250

Email: enquiries@claire.co.uk Website: www.claire.co.uk

CL:AIRE is a Charitable Company Limited by Guarantee / Registered in England No. 3740059 /
Entrust Enrolment No. 119820 / Registered Charity No. 1075611

CL:AIRE TRAINING

Certificate of Attendance

Continuing Professional Development

This is to certify that

Carl Orr

Has attended and passed the course
Verification of Gas Protection Systems

on

8th October 2019

at

Doncaster Membrane Installations Limited, Adwick
Park, Manvers, S63 5AB

Contact time: 6.5 hours

Trainers: Michael Corban & Gordon Cave:



Richard Froggatt, CL:AIRE Chairman

CL:AIRE

Registered address: 32 Bloomsbury Street, London, WC1B 3QJ
Telephone: +44 (0)2072 994250

Email: enquiries@claire.co.uk Website: www.claire.co.uk

CL:AIRE is a Charitable Company Limited by Guarantee / Registered in England No. 3740059 /
Entrust Enrolment No. 119820 / Registered Charity No. 1075611

CL:AIRE TRAINING



APPENDIX B

Design Drawings



Crown Copyright.
Licence Number 100040584. All rights reserved.
This map is not to be relied upon for accuracy and is for identification purposes only

SITE: Armory Drive, Gravesend

SCALE: NTS

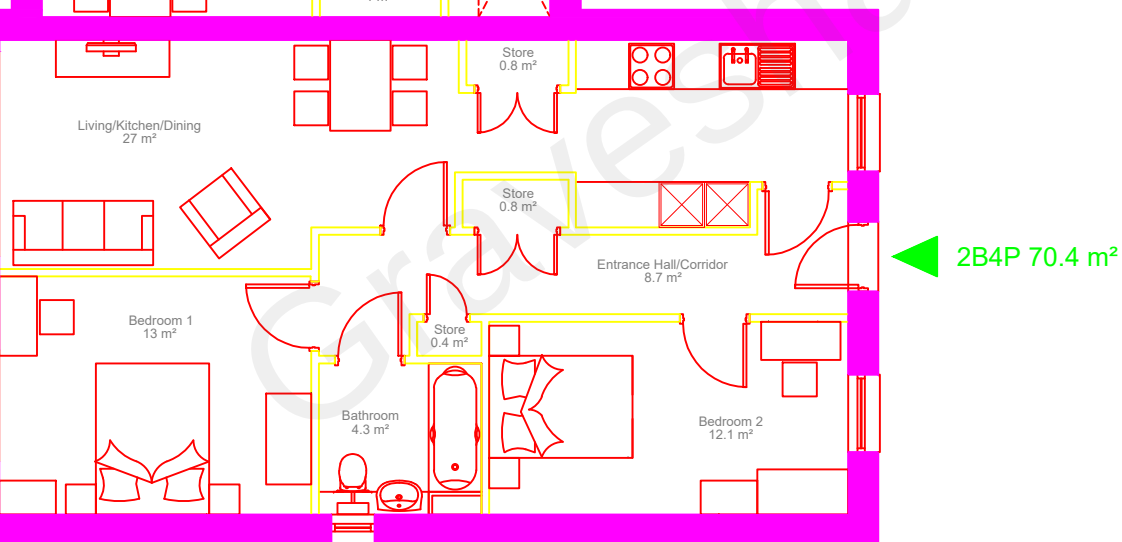
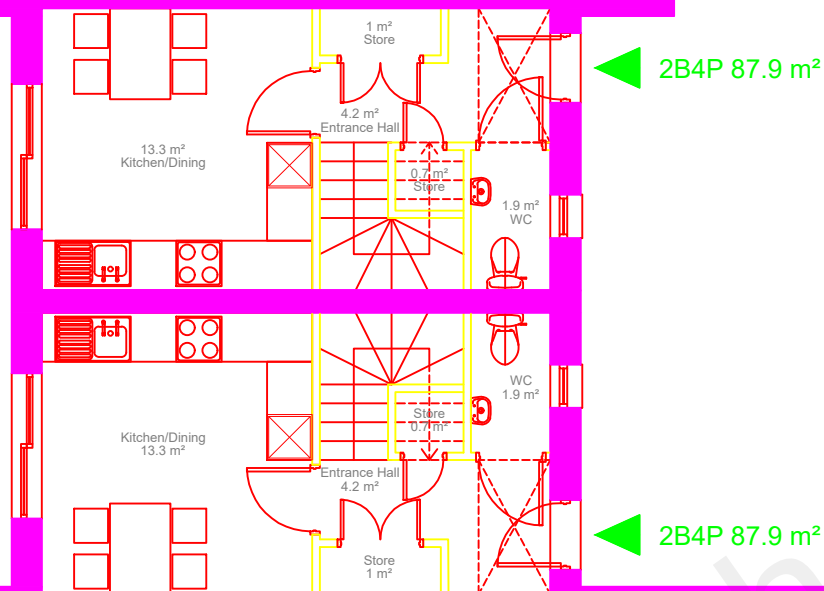
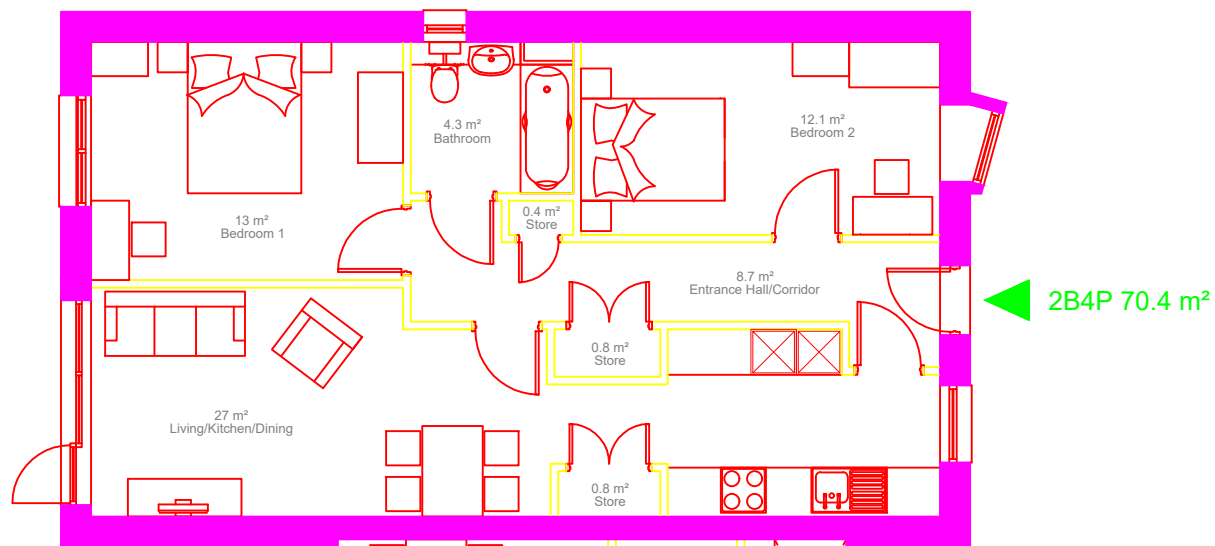
JOB NO: 4551

FIGURE TITLE: Site Location Plan

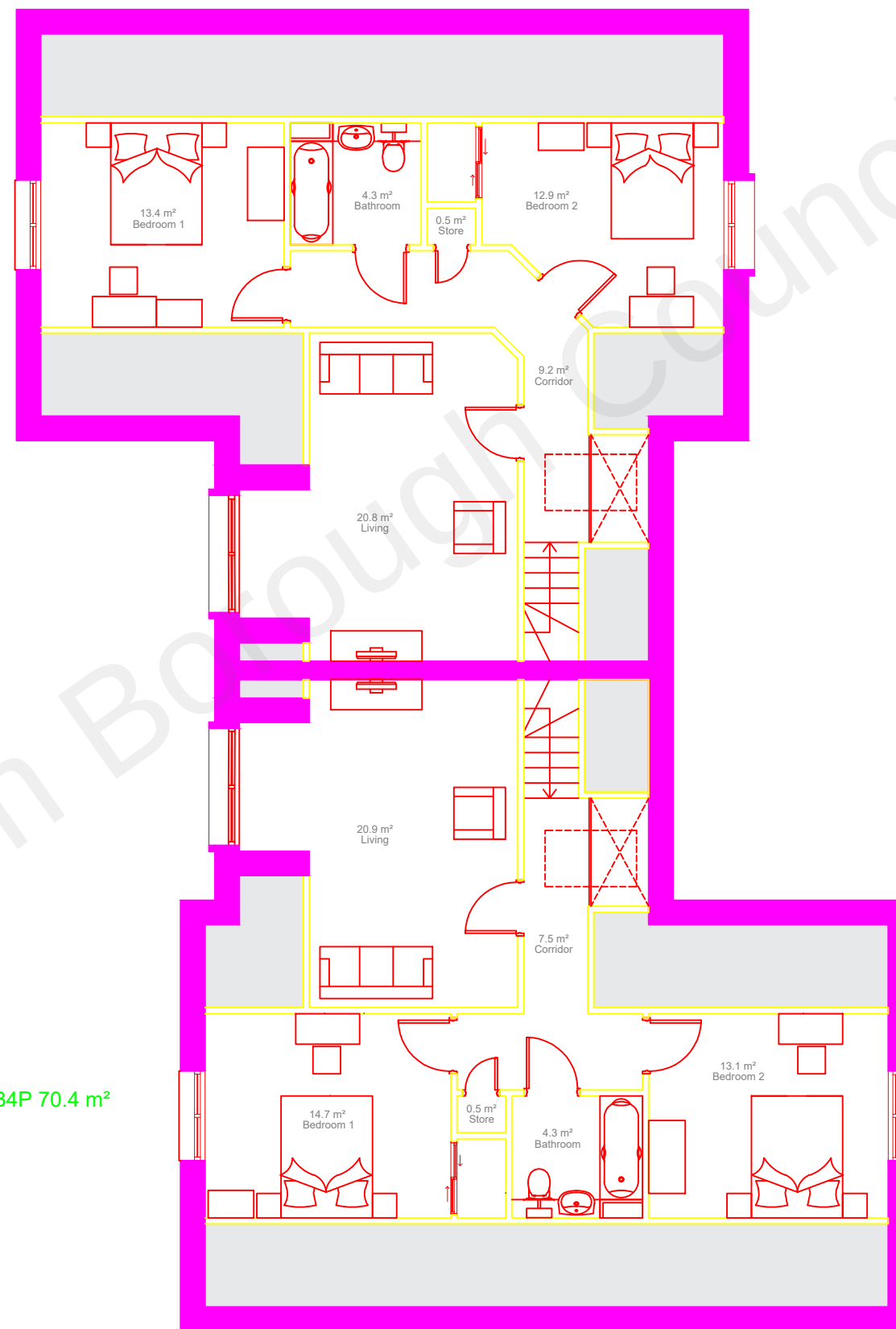
REV: 01

FIGURE NO: 03

SEVENOAKS
ENVIRONMENTAL
CONSULTANCY



Ground Floor Plan



First Floor Plan

P01	S3	06.03.20 2B4P Flat layouts	S3
P02	S3	28.05.20 Minor Amendments	S3

Gravesham Borough Council

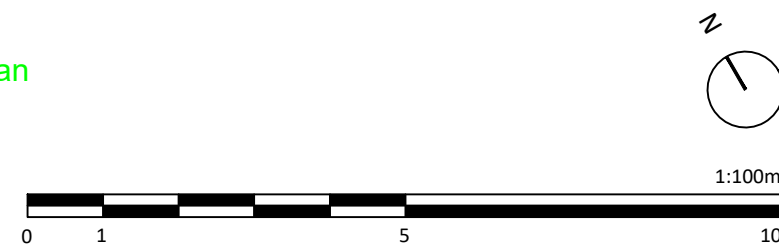
18-334 Albert Murray Close

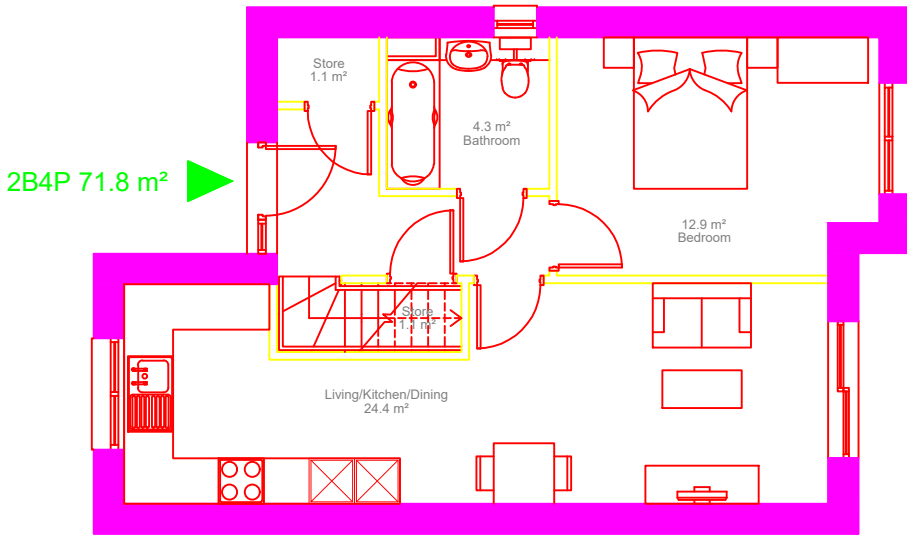
2B4P Flats Floor Plan Layouts

ADM-BPTW-01-ZZ-DR-A-1701 P02 S4

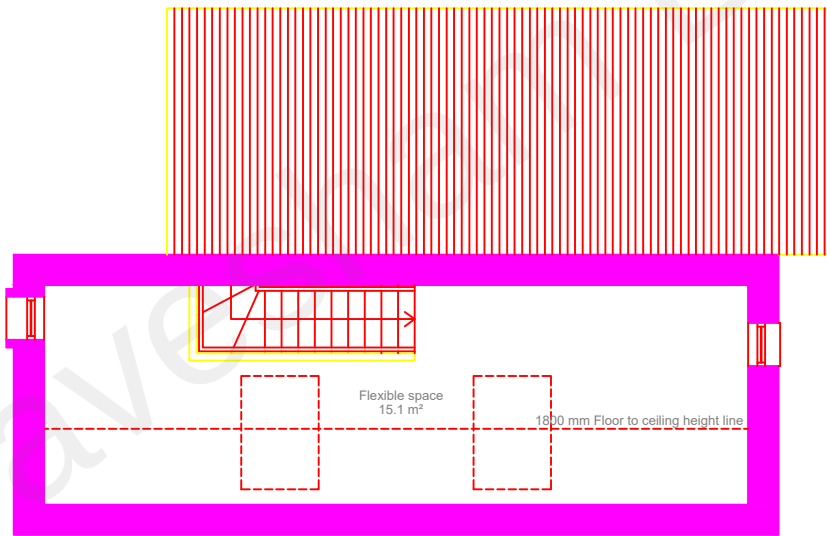
18-334 02 MS 1:100 @ A3

PLANNING ISSUE





Ground Floor Plan



First Floor Plan

P01	S3	19.03.20 1B2P Bungalow Flat Layout	MS
P02	S3	16.04.20 Minor amendments to the Flat Layout	MS
P03	S3	01.05.20 Minor amendments to the Flat Layout	MS
P04	S3	28.05.20 Minor Amendments	MS

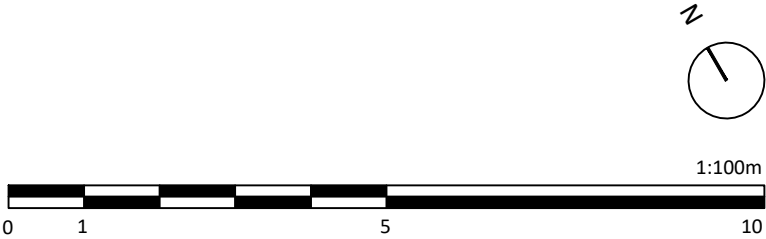
Gravesham Borough Council

Albert Murray Close

1B2P Bungalows Floor Plan Layout

AMD-BPTW-02-ZZ-DR-A-1702	P04	S4
18-334	02	MS 1:100 @ A3

PLANNING ISSUE



Refer to Energy Strategy for External wall U value

100mm, 3.5 N/mm² medium density concrete blockwork.

12.5mm plasterboard on dabs with 3mm skim coat finish to manufacturers recommendations.

Continuous dab to plasterboard

Apply expanding foam sealant tape or sealant to back and under the skirting prior to fixing

30mm White EPS Perimeter Insulation at 0.038 W/mK

Zedex CPT DPC or similar approved on inside face of block wall

75mm C25/30 structural concrete with a maximum aggregate size of 10mm

150mm Ridgid floor insulation as per construction specification.

Visqueen 1200 guage DPM or similar approved lapped with DPC

100mm medium density block infill

175mm depth concrete beam.

Refer to Energy Strategy for Floor U value

Proprietary 215x65mm Air bricks with telescopic extension sleeve to ventilate floor void as indicated on Housetype working drawings

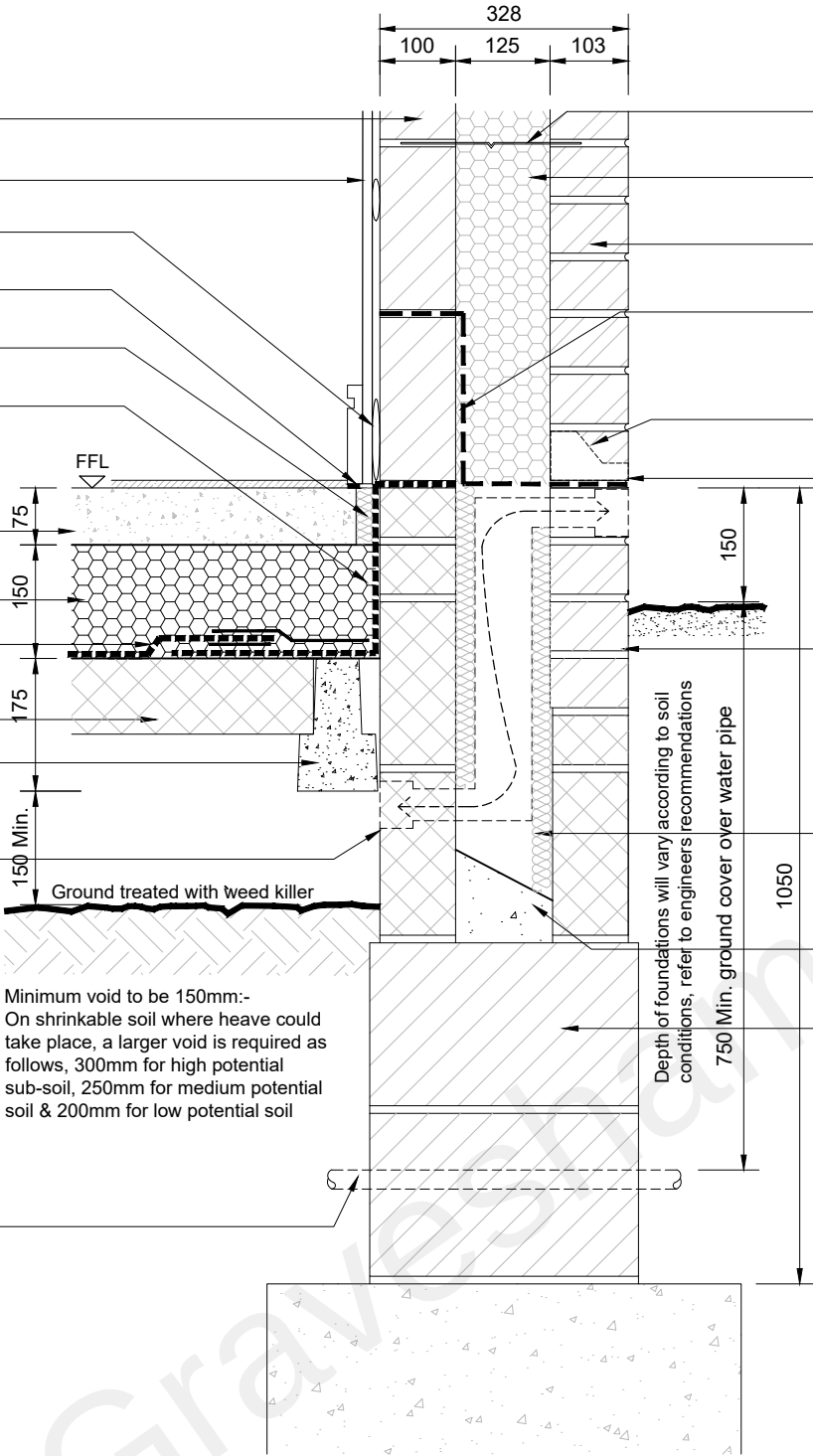
Use sulphate resisting cement below DPC where specified by the engineer. Weak mix concrete to within 225mm of lowest DPC.

Foundations in accordance with Structural Engineers drawings
Depth of foundations will vary according to soil conditions, refer to engineers recommendations

Indicative 25mmØ main.

Trench blocks may be reduced in lieu of trench fill provided the engineer is satisfied that the services can adequately exit the structure.

Note: Safe working practice for working within trench - banking back to ground conditions natural angle of repose.



Typical Foundation Detail - Beam in Section
Ground level 150mm below FFL

The Beam & Block system must be installed in strict accordance with the manufacturers instructions.

StaiFix HRT4 Wall ties or similar approved @ 900mm horizontal centres and 450mm vertical centres.

125mm Knauf Supafil Party Fulfill cavity blown insulation or similar approved

103mm Brickwork

Loose laid cavity tray integral with DPC locally over telescopic airvents (extended min 150mm either side)

"Pistol" weep holes @ 450mm centres

Zedex CPT DPC or similar approved, min 150mm from Ground in accordance with BS 8102:2009

Facing brickwork is to start minimum of 2 No. courses below finish ground level. Brickwork below DPC to be Class F2/S2 or to BS EN 771 with high durability mortar.

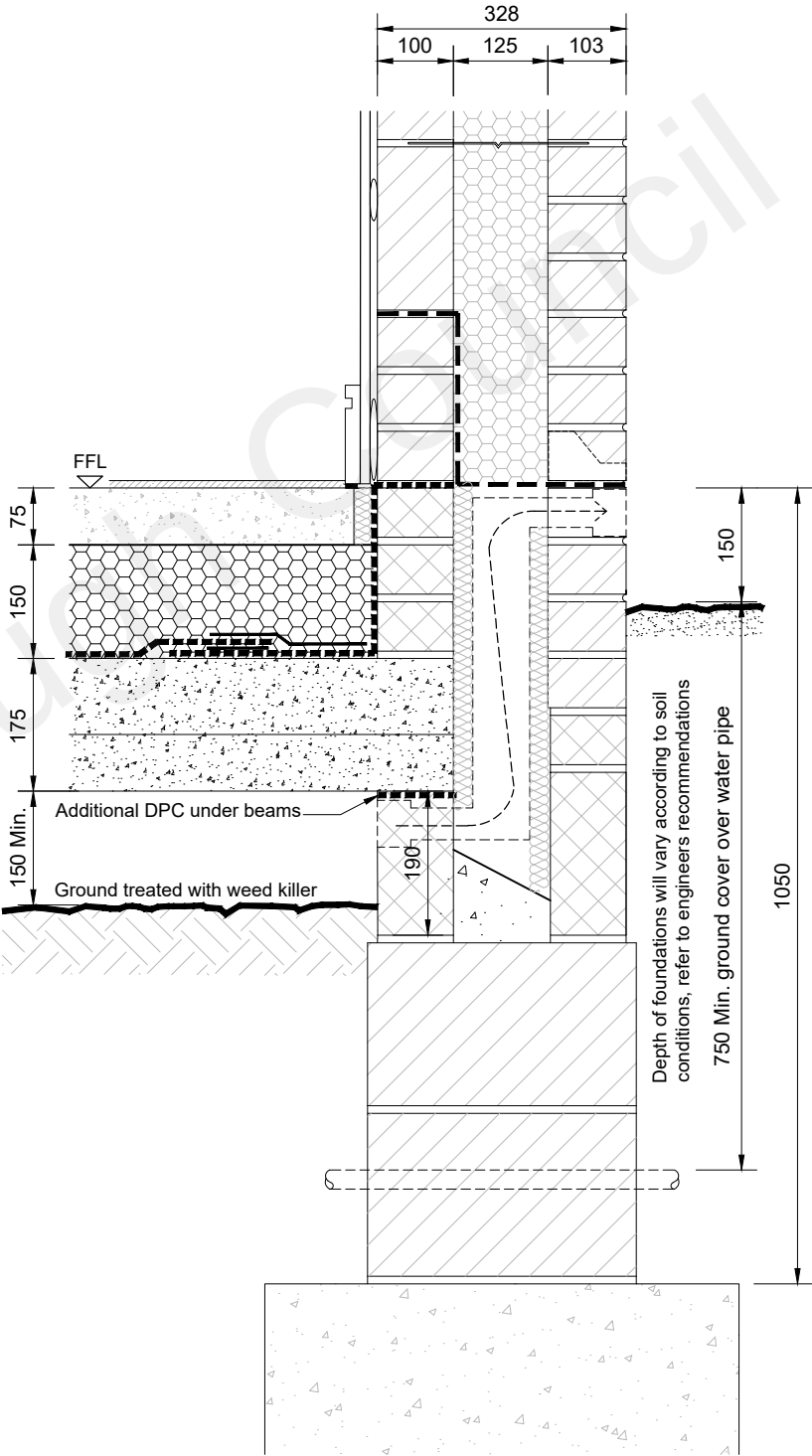
100mm Knauf Dritherm Earthwool 32 cavity slab or similar approved. Min. 225 below bottom of floor insulation.

Lean mix cavity fill

330mm wide foundation block or 2 leaves of 100mm 7.0N/mm² concrete blockwork as per construction specification.

NHBC Standards States:
Chapter 5.2.10 (b) Ventilation of Under Floor Voids

Voids should be ventilated by openings providing not less than 1500mm² per metre run or of external wall or 500mm² per m² of floor area, which ever gives the greater opening area. Ventilation openings should be provided on at least two opposite sides. Where this is not possible, effective cross ventilation from opposite sides should be provided by a combination of opening and air ducts. See vent schedule



Typical Foundation Detail - Beam in Elevation
Ground level 150mm below FFL -
Showing beams spanning onto blockwork

Typical Detail - Ground Level 150mm below FFL

50mm @ A3

Scale 1:10 100mm 200mm 300mm 400mm 500mm

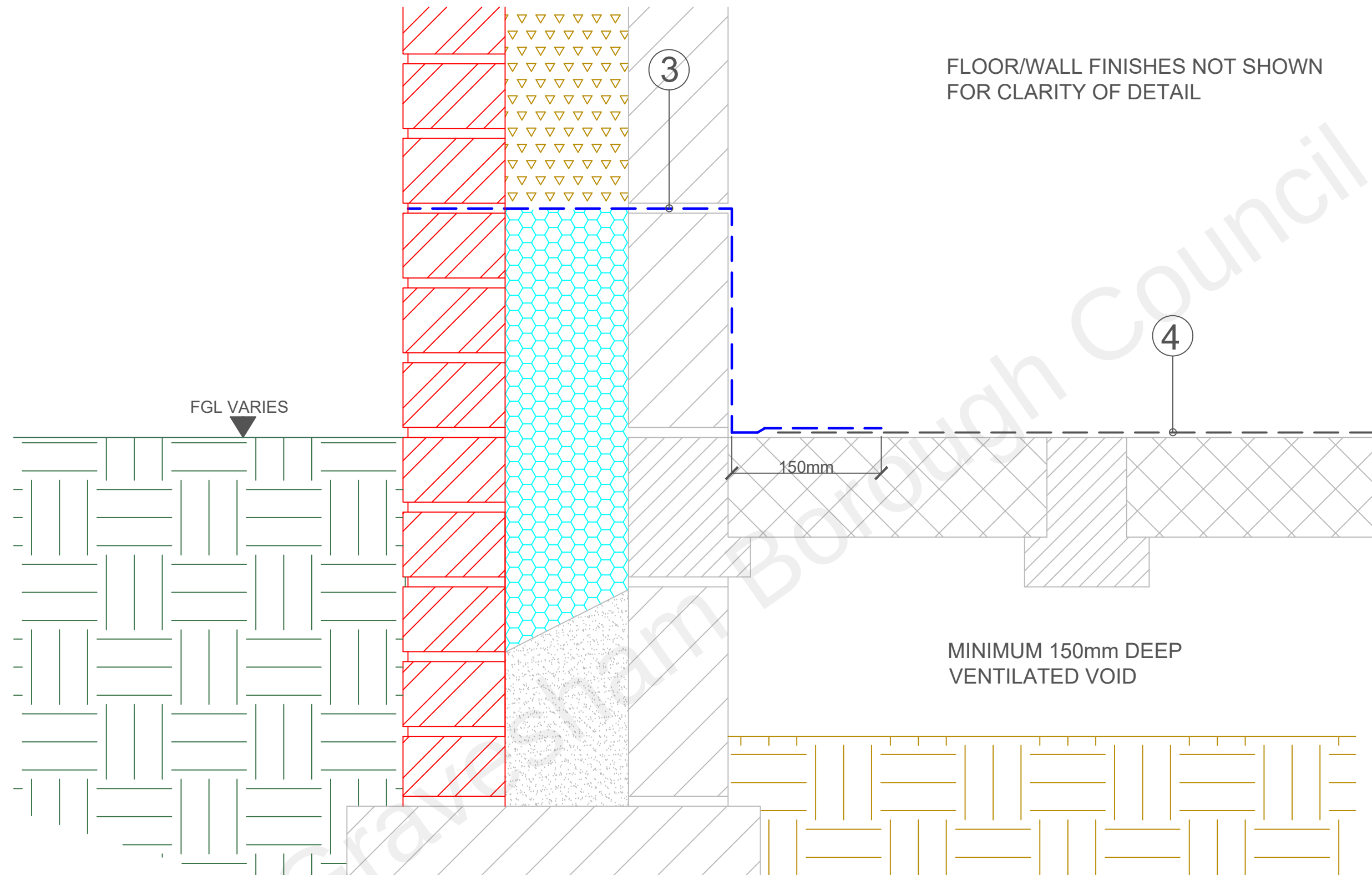
DRAWING STATUS:
APPROVAL

GENERAL NOTES

1. DO NOT SCALE

2. All dimensions are in millimeters unless stated otherwise

REV	AMENDMENTS	BY	DATE
Architectural Design Lab Ltd. Lombard House 12 - 17 Upper Bridge Street Canterbury Kent CT1 2NF Tel . no : 01227 634600 Email : mail@adl15.com			
Drawn :	RB	Date :	MAY 2022
Scale :	1:10	Checked :	MG
Title :			
SUBSTRUCTURE DETAILS GROUND FLOOR GROUND 150mm Below FFL			
Job : ARMOURY DRIVE, GRAVESEND			
Drg. No : DL-SUB-01		Rev : -	
Dwg file name:		A3	
Copyright Reserved Architectural Design Lab Limited			



TYPICAL PERIMETER WALL DETAIL (UN-VENTILATED) KEY TO MATERIALS

1. PERISCOPIC AIRBRICK VENT SETS INSTALLED AT MAXIMUM 3M CENTRES AROUND EACH PROPERTY
2. CAVITY TRAY SPECIFICATION 'BY OTHERS'
3. JUTA GP DPC, OF FULLY WELDED SEAM CONSTRUCTION
4. JUTA GP5 GAS BARRIER MEMBRANE OF FULLY WELDED SEAM JOINTS WITH 50mm WELD ONTO DPC

General Notes

Do not scale from this drawing.

All dimensions to be checked on site.

The installed/remediated gas protection system is to be fully inspected by an independent body in accordance with the CIRIA C735 document.

This drawing is to be read in conjunction with MTS.DVP.852-BA 3rd Party Design, Testing & Verification Plan.



Warning Health & Safety Information!

This drawing relates to the low/moderate ground gas risk and hydrocarbon vapour issues on this site.

In conjunction with the CDM 2015 regulations we confirm that the site is within an area where ground gas and hydrocarbon vapours may be present, therefore whilst remedial measures may have been performed, there is a residual low risk, caution should be taken when working with contaminated soils.

Site operatives are to wash hands before eating, drinking, smoking or during any activity which could lead to the ingestion of contaminated materials.

The following drawings should be consulted for gas/vapour mitigation details;

22852-01
22852-02
22852-03
22852-04
22852-05
22852-06

No.	Revision/Issue	Date

Firm Name and Address



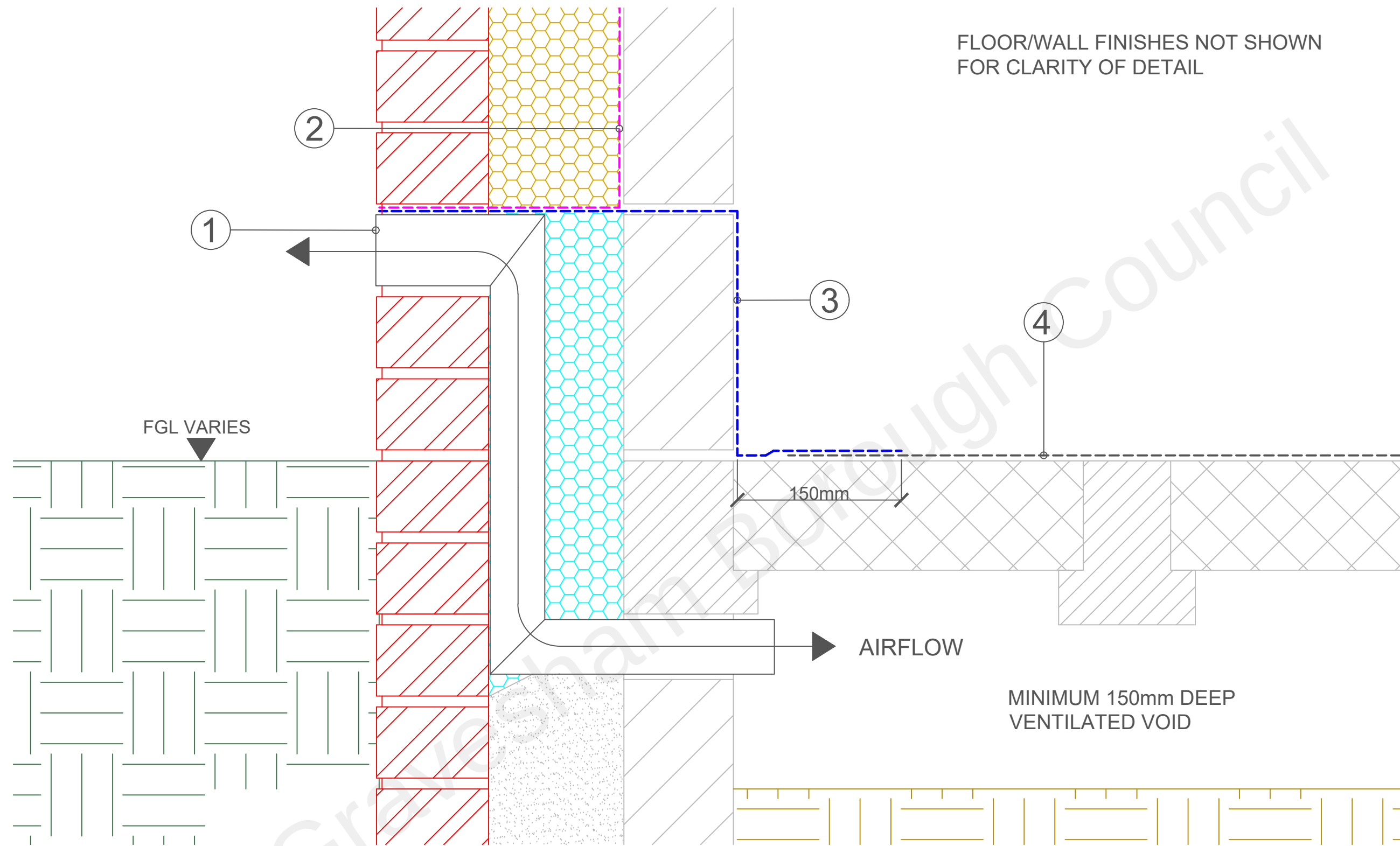
Project Name and Address

Former St. Johns Ambulance Station,
Armoury Drive, Gravesend,
DA12 1NB

Drawing Title

Typical Perimeter Wall
(Un-Ventilated) Gas Mitigation
Section Detail

Project 22852-01	Sheet Rev -
Date 11/10/2022	Drawn By B.Ackroyd
Scale Not to Scale	Size A3



1. PERISCOPIC AIRBRICK VENT SETS INSTALLED AT MAXIMUM 3M CENTRES AROUND EACH PROPERTY
2. CAVITY TRAY SPECIFICATION ABOVE AIRBRICKS 'BY OTHERS'
3. JUTA GP DPC, OF FULLY SEALED SEAM CONSTRUCTION
4. JUTA GP5 GAS BARRIER MEMBRANE OF FULLY WELDED SEAM JOINTS WITH 50mm WELD ONTO EXISTING DPC

General Notes

Do not scale from this drawing.

All dimensions to be checked on site.

The installed/remediated gas protection system is to be fully inspected by an independent body in accordance with the CIRIA C735 document.

This drawing is to be read in conjunction with MTS.DVP.852-BA 3rd Party Design, Testing & Verification Plan.



Warning Health & Safety Information!

This drawing relates to the low/moderate ground gas risk and hydrocarbon vapour issues on this site.

In conjunction with the CDM 2015 regulations we confirm that the site is within an area where ground gas and hydrocarbon vapours may be present, therefore whilst remedial measures may have been performed, there is a residual low risk, caution should be taken when working with contaminated soils.

Site operatives are to wash hands before eating, drinking, smoking or during any activity which could lead to the ingestion of contaminated materials.

The following drawings should be consulted for gas/vapour mitigation details;

22852-01
22852-02
22852-03
22852-04
22852-05
22852-06

No.	Revision/Issue	Date

Firm Name and Address



Project Name and Address

Former St. Johns Ambulance Station,
Armoury Drive, Gravesend,
DA12 1NB

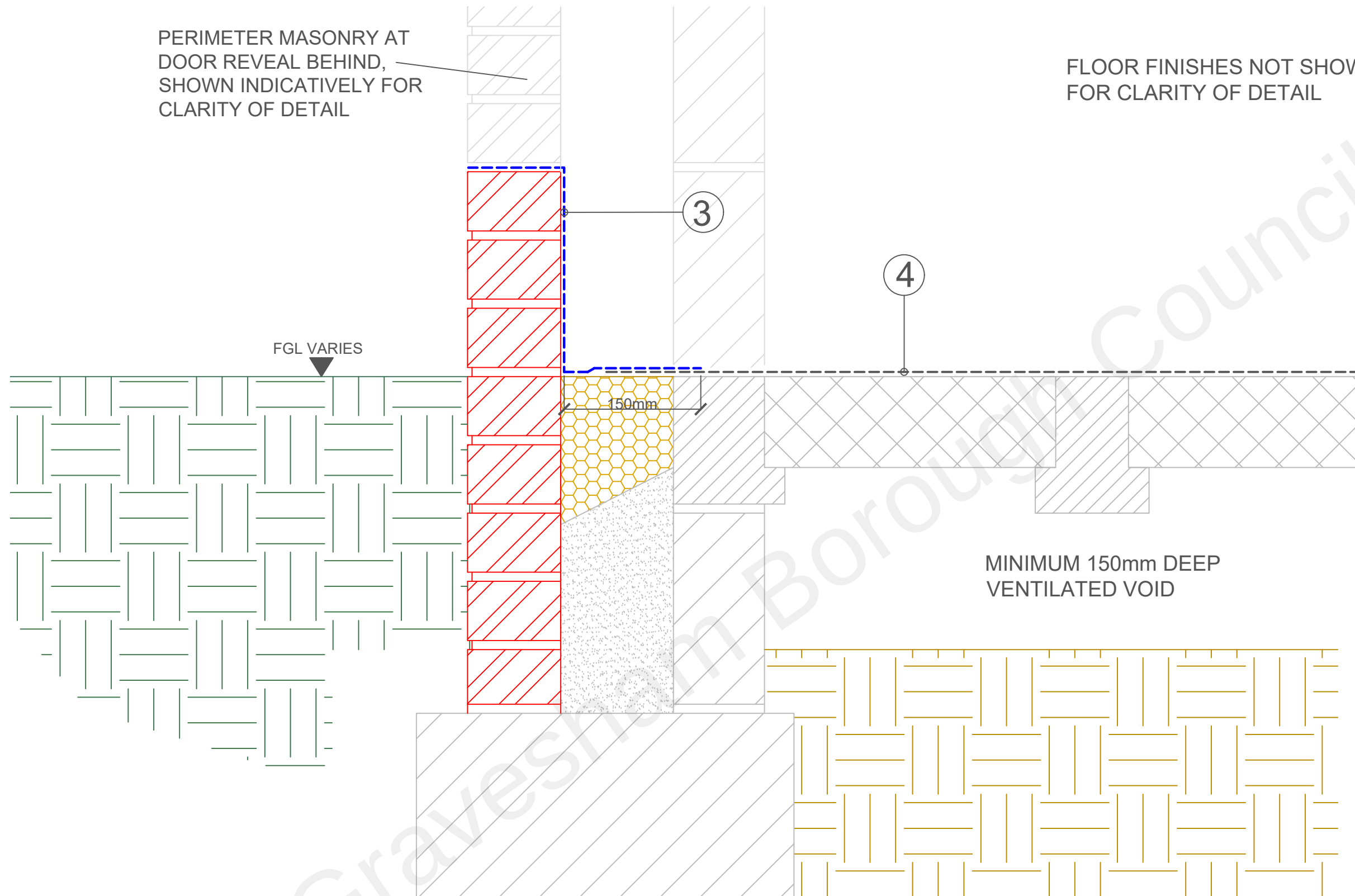
Drawing Title

Typical Perimeter Wall (Ventilated)
Gas Mitigation Section Detail

Project 22852-02	Sheet Rev -
Date 11/10/2022	Drawn By B.Ackroyd
Scale Not to Scale	Size A3

PERIMETER MASONRY AT
DOOR REVEAL BEHIND,
SHOWN INDICATIVELY FOR
CLARITY OF DETAIL

FLOOR FINISHES NOT SHOWN
FOR CLARITY OF DETAIL



TYPICAL DOOR THRESHOLD DETAIL

KEY TO MATERIALS

1. PERISCOPIC AIRBRICK VENT SETS INSTALLED AT MAXIMUM 3M CENTRES AROUND EACH PROPERTY
2. CAVITY TRAY SPECIFICATION ABOVE AIRBRICKS 'BY OTHERS'
3. JUTA GP DPC, OF FULLY SEALED SEAM CONSTRUCTION
4. JUTA GP5 GAS BARRIER MEMBRANE OF FULLY WELDED SEAM JOINTS WITH 50mm WELD ONTO EXISTING DPC

General Notes

Do not scale from this drawing.

All dimensions to be checked on site.

The installed/remediated gas protection system is to be fully inspected by an independent body in accordance with the CIRIA C735 document.

This drawing is to be read in conjunction with MTS.DVP.852-BA 3rd Party Design, Testing & Verification Plan.



Warning Health & Safety Information!

This drawing relates to the low/moderate ground gas risk and hydrocarbon vapour issues on this site.

In conjunction with the CDM 2015 regulations we confirm that the site is within an area where ground gas and hydrocarbon vapours may be present, therefore whilst remedial measures may have been performed, there is a residual low risk, caution should be taken when working with contaminated soils.

Site operatives are to wash hands before eating, drinking, smoking or during any activity which could lead to the ingestion of contaminated materials.

The following drawings should be consulted for gas/vapour mitigation details;

22852-01
22852-02
22852-03
22852-04
22852-05
22852-06

No.	Revision/Issue	Date

Firm Name and Address



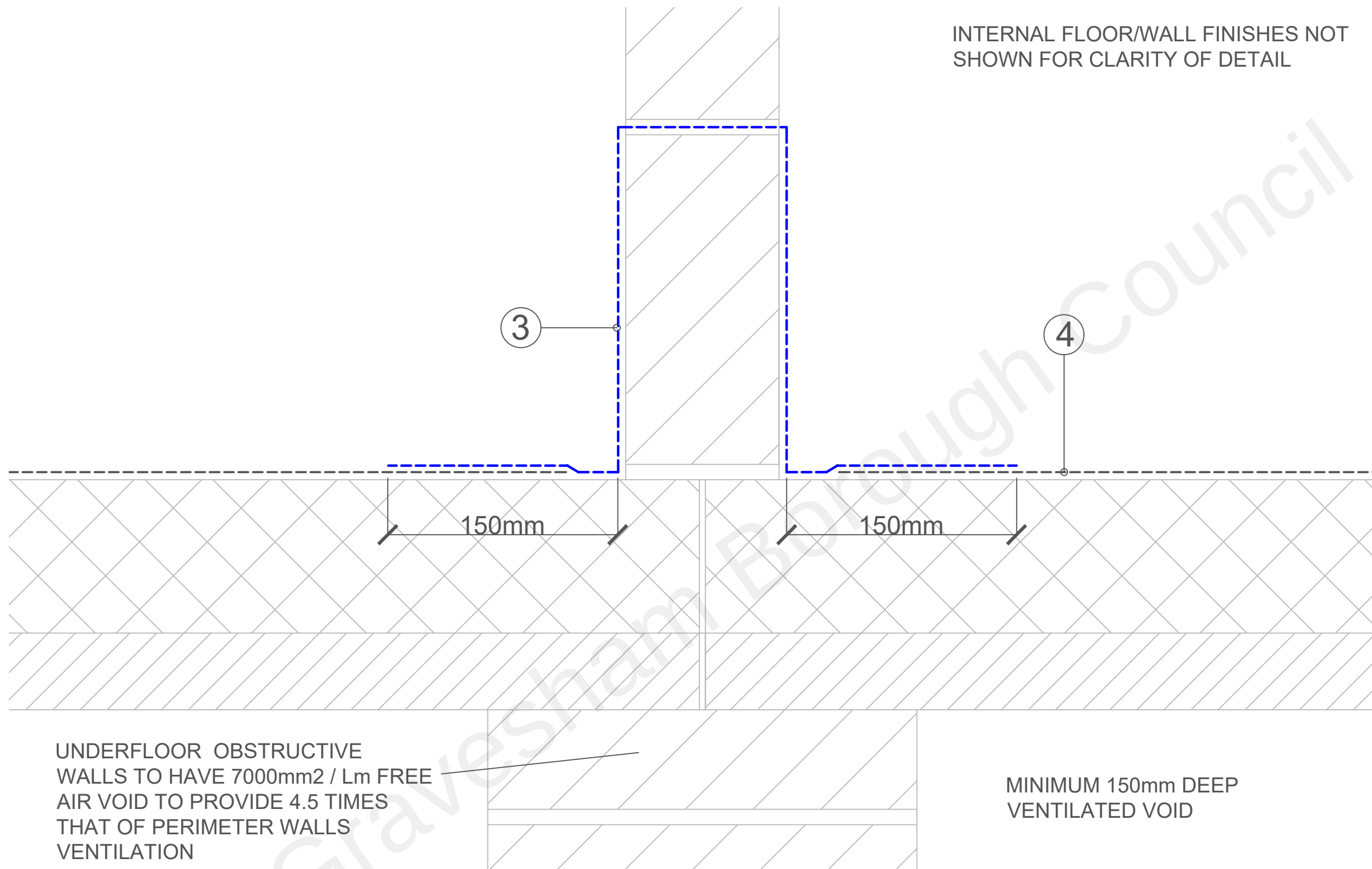
Project Name and Address

Former St. Johns Ambulance Station,
Armoury Drive, Gravesend,
DA12 1NB

Drawing Title

Typical Door Threshold Detail

Project 22852-03	Sheet Rev A
Date 11/10/2022	Drawn By B.Ackroyd
Scale Not to Scale	Size A3



INTERNAL WALL DPC DETAIL

General Notes

Do not scale from this drawing.

All dimensions to be checked on site.

The installed/remediated gas protection system is to be fully inspected by an independent body in accordance with the CIRIA C735 document.

This drawing is to be read in conjunction with MTS.DVP.852-BA 3rd Party Design, Testing & Verification Plan.

Warning Health & Safety Information!

This drawing relates to the low/moderate ground gas risk and hydrocarbon vapour issues on this site.

In conjunction with the CDM 2015 regulations we confirm that the site is within an area where ground gas and hydrocarbon vapours may be present, therefore whilst remedial measures may have been performed, there is a residual low risk, caution should be taken when working with contaminated soils.

Site operatives are to wash hands before eating, drinking, smoking or during any activity which could lead to the ingestion of contaminated materials.

The following drawings should be consulted for gas/vapour mitigation details;

22852-01
22852-02
22852-03
22852-04
22852-05
22852-06

No.	Revision/Issue	Date

Firm Name and Address

MembraneTestingSolutions

The Studio, Pennington House,
Pennington Street, Haverhill,
Essex CO1 1R

Office: 01473 222 224
Out of Hours Contact:
Telephone: 01473 222 224
Mobile: 01473 222 224
Email: info@mtsolutions.co.uk

www.mtsolutions.net

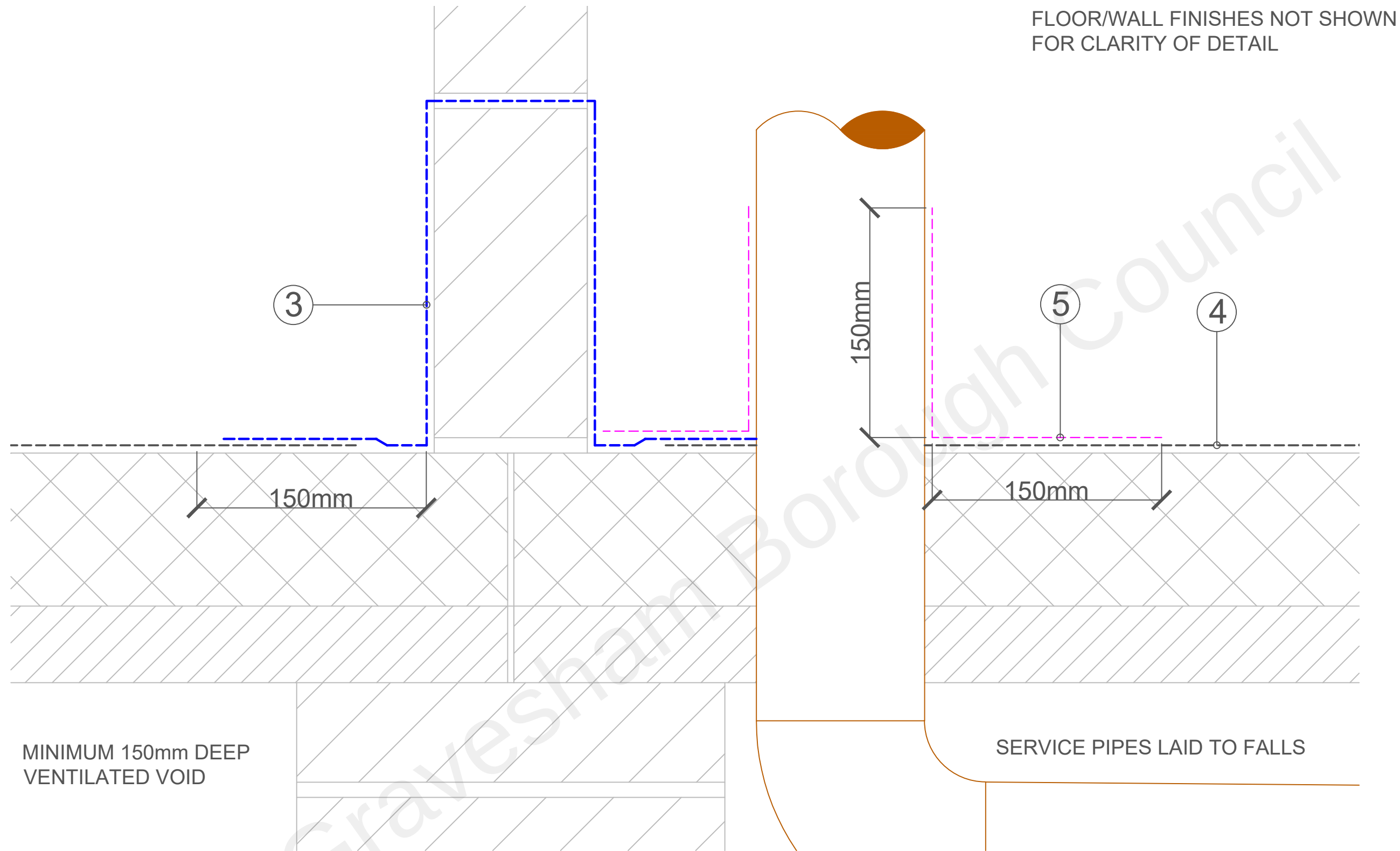
Project Name and Address

Former St. Johns Ambulance Station,
Armoury Drive, Gravesend,
DA12 1NB

Drawing Title

Typical Internal Wall DPC Detail
With Under Floor Wall Ventilation

Project 22852-04	Sheet Rev -
Date 11/10/2022	Drawn By B.Ackroyd
Scale Not to Scale	Size A3



KEY TO MATERIALS

1. PERISCOPIC AIRBRICK VENT SETS INSTALLED AT MAXIMUM 3M CENTRES AROUND EACH PROPERTY
2. CAVITY TRAY SPECIFICATION 'BY OTHERS'
3. JUTA GP DPC, OF FULLY WELDED SEAM CONSTRUCTION
4. JUTA GP5 GAS BARRIER MEMBRANE OF FULLY WELDED SEAM JOINTS WITH 50mm WELD ONTO DPC
5. JUTA GP SAM (GAS RESISTANT SELF-ADHESIVE MEMBRANE)

General Notes

Do not scale from this drawing.

All dimensions to be checked on site.

The installed/remediated gas protection system is to be fully inspected by an independent body in accordance with the CIRIA C735 document.

This drawing is to be read in conjunction with MTS.DVP.852-BA 3rd Party Design, Testing & Verification Plan.

Warning Health & Safety Information!

This drawing relates to the low/moderate ground gas risk and hydrocarbon vapour issues on this site.

In conjunction with the CDM 2015 regulations we confirm that the site is within an area where ground gas and hydrocarbon vapours may be present, therefore whilst remedial measures may have been performed, there is a residual low risk, caution should be taken when working with contaminated soils.

Site operatives are to wash hands before eating, drinking, smoking or during any activity which could lead to the ingestion of contaminated materials.

The following drawings should be consulted for gas/vapour mitigation details;

22852-01
22852-02
22852-03
22852-04
22852-05
22852-06

No.	Revision/Issue	Date

Firm Name and Address

Membrane Testing Solutions

The Studio, Pennington House, Pennington Street, Halesowen, West Midlands, B62 9JH

Office: 0121 707 5555
Cell of Home Contact: 0121 707 5555
www.mtsltd.net

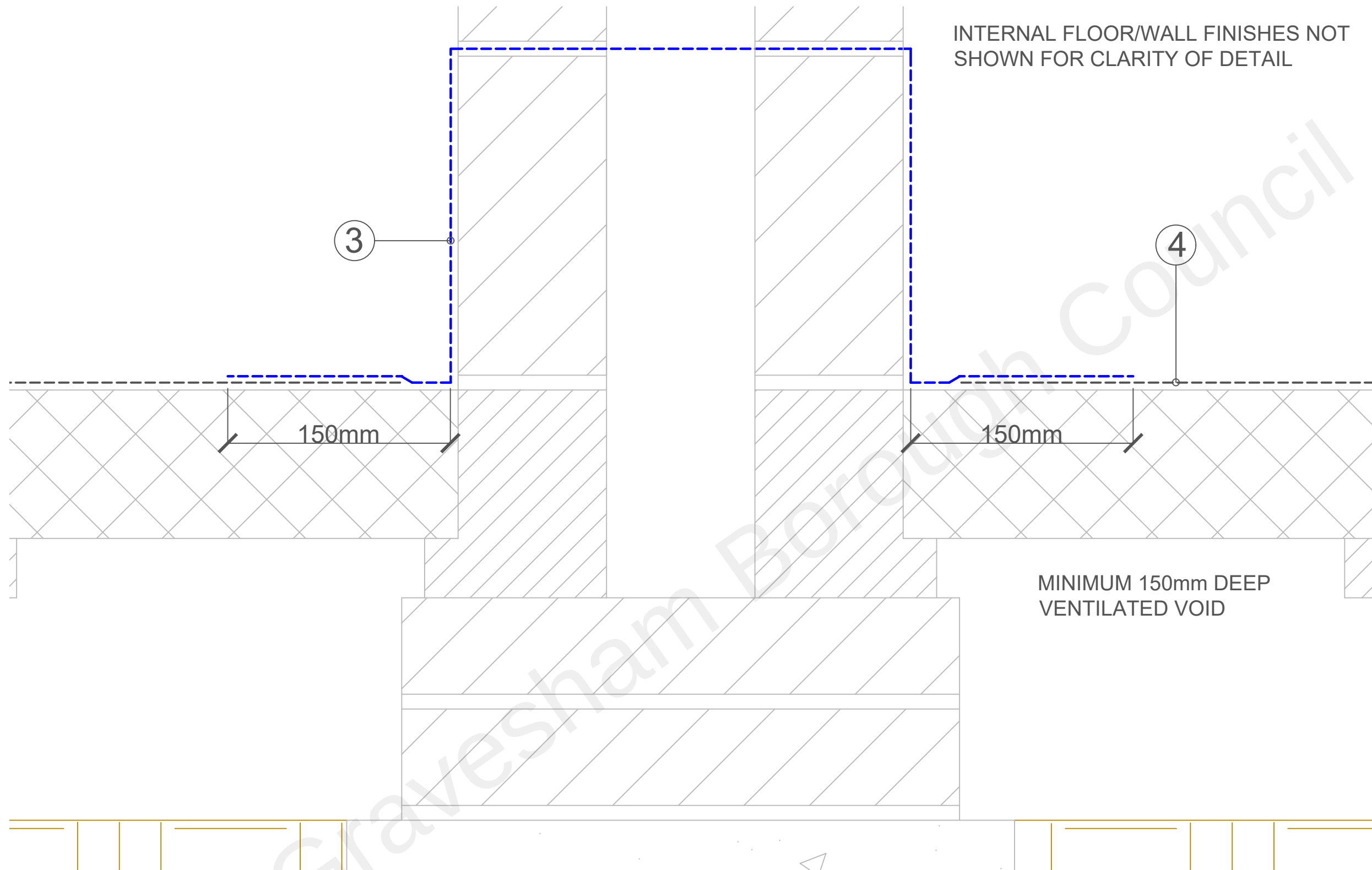
Project Name and Address

Former St. Johns Ambulance Station, Armoury Drive, Gravesend, DA12 1NB

Drawing Title

Typical Service Pipe Sealing Detail

Project	22852-05	Sheet	Rev -
Date	11/10/2022	Drawn By	B.Ackroyd
Scale	Not to Scale	Size	A3



General Notes

Do not scale from this drawing.

All dimensions to be checked on site.

The installed/remediated gas protection system is to be fully inspected by an independent body in accordance with the CIRIA C735 document.

This drawing is to be read in conjunction with MTS.DVP.852-BA 3rd Party Design, Testing & Verification Plan.



Warning Health & Safety Information!

This drawing relates to the low/moderate ground gas risk and hydrocarbon vapour issues on this site.

In conjunction with the CDM 2015 regulations we confirm that the site is within an area where ground gas and hydrocarbon vapours may be present, therefore whilst remedial measures may have been performed, there is a residual low risk, caution should be taken when working with contaminated soils.

Site operatives are to wash hands before eating, drinking, smoking or during any activity which could lead to the ingestion of contaminated materials.

The following drawings should be consulted for gas/vapour mitigation details;

22852-01
22852-02
22852-03
22852-04
22852-05
22852-06

No.	Revision/Issue	Date

Firm Name and Address

MembraneTestingSolutions

The Studio, Portage House,
Riverside Drive, Rotherham,
S64 7JH

0114 255 1111
0114 255 1111
0114 255 1111
0114 255 1111
0114 255 1111

www.mtsd.net

Project Name and Address

Former St. Johns Ambulance Station,
Armoury Drive, Gravesend,
DA12 1NB

Drawing Title

Typical Party Wall Gas Resistant
DPC Detail

Project	Sheet
22852-06	Rev -
Date	Drawn By
14/10/2022	B.Ackroyd
Scale	Size
Not to Scale	A3



APPENDIX C

Material Specifications



GP® TITANTECH® DPC

GP® TITANTECH® DPC - Gas and Hydrocarbon Resistant DPC is a unique single layer, embossed High Performance DPC. GP® TITANTECH® DPC is specifically designed and manufactured to perform as a Methane, Carbon dioxide, VOC, Radon and Moisture resistant damp proof course.

Thickness	1.0 mm
Width	1.3 m
Length	20 m
Weight	921 g/m ²

TITANTECH®

For developers of brownfield and contaminated sites the TITANTECH® family of products represent a major step forward in safeguarding projects against gaseous and chemical contamination.

GP® TITANTECH® DPC complies with the latest codes of practice as published by BRE, CIRIA and BSI (BS EN 14909, BS8485:2015 and C748). Suitable for use as a High Performance DPC for vertical and horizontal applications. Superior adhesion to mortar is essential for buildings of 3+ storey height.

JUTA GP® TITANTECH® DPC has an embossed surface to create superior mortar adhesion which is essential when being used in 3+ storey applications. JUTA GP® TITANTECH® DPC is compliant to BS EN 14909:2012 and can be used in both vertical and horizontal applications.

Handling

Roll weights can be in excess of 5 kg and hence appropriate care and equipment is required for unloading and handling.





Feature	Characteristics	Test Method	GP® TITANTECH® DPC
Physical Properties	Thickness	EN 1849-2	1.0 mm
	Width	EN 1849-2	1.3 m
	Length	EN 1849-2	20 m
	Weight	EN 1849-2	921 g/m ²
Hydraulic Properties	Water Vapour Permeation	EN 1932	0.08 g/m ² /day
	Resistance to Water Penetration	EN 13967, EN 1928	Pass
	Watertightness	EN 1928	Pass
Mechanical Properties	Resistance to Static Load	EN 12730 - B	20 kg
	Tensile Strength (MD)	EN 12311-1	24 N/mm ²
	Tensile Strength (CMD)	EN 12311-1	22 N/mm ²
	Tensile Elongation (MD)	EN 12311-1	398%
	Tensile Elongation (CMD)	EN 12311-1	446%
	Puncture Resistance	EN 12236	1.25 kN
	Resistance to Tearing (nail shank) MD	EN 12310-1	700 N
	Resistance to Tearing (nail shank) CMD	EN 12310-1	750 N
Durability and Chemical Resistance	Transmission rate of volatile liquids - Diesel	ISO 6179:2010 (B)	0.096 g/m ² /h
	Transmission rate of volatile liquids - Xylene	ISO 6179:2010 (B)	4.845 g/m ² /h
	Transmission rate of volatile liquids - Toulene	ISO 6179:2010 (B)	6.695 g/m ² /h
	Transmission rate of volatile liquids - Petrol	ISO 6179:2010 (B)	5.172 g/m ² /h
	Heat Ageing	EN 1926	Pass
	Chemical Resistance	EN 1847	Pass
	Resistance to Fire	EN 13501-1	Class F
	Resistance to Low Temperature	EN 495-5	Pass @ -40°C
Gas Permeability	Methane Permeability	BS EN ISO 15105-1	28 ml/m ² /day/atm
	Carbon Dioxide Permeability	BS EN ISO 15105-1	<28 ml/m ² /day/atm
	Radon Permeability	K124/02/95	9.5x10 ⁻¹² /m ² /s
Compliance and Certification	CE Mark - EN13967:2012		
	NHBC Standards Compliant		
	BS EN 14909:2012 Compliant		
	BS 8485:2015 Compliant		

Feature	Pre-Compression (N/mm ²)	Characteristic Shear Strength (N/mm ²)
Characteristic Shear Strength	0.2	0.14
	0.6	0.34
	1.0	0.52



Storage

Rolls of JUTA GP® TITANTECH® DPC should be stored on stable/level ground and stacked not more than five rolls high, with no other material stacked on top. The rolls can be stored outdoors when packaged but should be protected from exposure to UV. JUTA GP® TITANTECH® DPC is classified as non-hazardous and is chemically inert such that it will not react with any acid or alkali environment in which it is used.

JUTA UK

For additional information or assistance, please contact JUTA UK directly.

Installation

JUTA GP® TITANTECH® DPC must be installed in accordance with the guidelines laid out in BS8215:1991, BS8000: part 3 and BS 5628. It can be used in most common floor constructions and is installed in a similar manner to damp proof membrane. For external walls the DPC should be applied 150mm above the adjoining surface and should be linked to a DPM or Gas Resistant DPM in solid floors. The DPC should be applied to a fresh bed of mortar, completely free of projections that may puncture the material or impede the DPC from lying flat.

Joining and Sealing

Sheets of JUTA GP® TITANTECH® DPC must be clean, dry and free from dirt and grease before application of joining tape. JUTA GP® DPC may also be heat welded to the underlying Gas resistant membrane.

Accessory Products

JUTA GP® TITANTECH® DPC is an accessory product for use in combination with GP® 1, GP® 2, GP® H, GP® SAM and GP® TITANTECH® gas protective membranes. It is also compatible with a range of DPM and other DPC materials.

Juta GP[®] 5 Gas Barrier is a multi-layer composite of virgin polyethylene (PE) giving exceptional resistance to the passage of Ground gas and Organic Vapours. It also acts as a high performance DPM.

Juta GP[®] 5 is suitable for the following applications:

- VOC contaminated sites (Site specific assessment required)
- Carbon dioxide and methane affected sites in accordance with BS8485:2015+A1:2019 & NHBC
- Radon affected sites in accordance with BRE211:2015
- Damp protection in accordance with Building Regulations Part C.

JUTA GP [®] 5			
Characteristics	Test Method	Unit	JUTA GP [®] 5
Physical Properties			
Thickness	EN 1849-2	mm	0.4
Width	EN 1849-2	m	Various
Length	EN 1849-2	m	Various
Weight	EN 1849-2	g/M ²	400
Hydraulic Properties			
Resistance to Water Penetration	EN 1928 (A)	-	Pass
Mechanical Properties			
Resistance to Static Load	EN 12730	Kg	>20
Tensile Strength (MD)	EN 12311-2 (A)	N/50mm	>300
Tensile Strength (CMD)	EN 12311-2 (A)	N/50mm	>300
Resistance to Tearing (Nail Shank) MD	EN 12310-1	N	>230
Resistance to Tearing (Nail Shank) CMD	EN 12310-1	N	>230
Impact Resistance	EN12691-B	mm	500
Puncture Resistance	A5TM D 4833	N	>160
Puncture Resistance	EN12236	kN	1.60
Reaction to Fire	EN 13501-1	-	E
Vapour Permeability			
Methane Permeability	B5 EN ISO 15105-1	ml/m ² /day/atm	0.12
Carbon Dioxide Permeability	B5 EN ISO 15105-1	ml/m ² /day/atm	1.53
Hydrogen Permeability	B5 EN ISO 15105-1	ml/m ² /day/atm	68.7
Benzene Permeability	B5 EN ISO 15105-2	ml/m ² /day	0.41
Oxygen Permeability	B5 EN ISO 15105-2	ml/m ² /day	<3
Radon Permeability	K124/02/95	m ² /s	1.0 x 10 ⁻¹²
Fuel Vapour Permeability			
Petrol	B5 EN ISO 15105-2	/mol/(m ² .s.Pa)	(ave.) 3.4 x 10 ⁻¹³
Diesel	B5 EN ISO 15105-2	/mol/(m ² .s.Pa)	(ave.) 3.4 x 10 ⁻¹³
Durability			
Durability watertightness after artificial ageing	EN1928	-	Pass
Durability watertightness against chemicals	EN1928	-	Pass
Compliance and Certification			
CE Mark - EN13967:2012			
NHBC Standards Compliant			
B5 8485:2015 + A1 2019 Accordant			

Additional Information

HANDLING

Roll weights can be in excess of 20kg and hence appropriate care and equipment is required for unloading and handling.

STORAGE

Rolls of JUTA GP® 5 should be stored on stable/level ground and stacked not more than five rolls high, with no other material stacked on top. The rolls can be stored outdoors when packaged, but should be protected from exposure to UV.

INSTALLATION

JUTA GP® 5 should be installed in accordance with the product installation guidelines, and in accordance with BS 8485:2015.

JOINTING AND SEALING

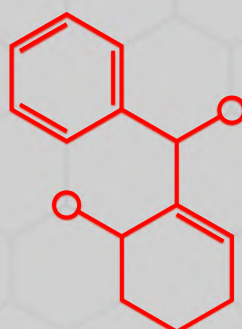
It is recommended JUTA GP® 5 be heat welded where possible, with welding carried out by competent personnel with suitable qualifications in accordance with best practice, and guidance contained within BS 8485:2015. JUTA GP® 5 should be overlapped by at least 100mm. If taping joints, only suitable tape must be used, ensuring application with a silicone roller to remove trapped air. JUTA pre-formed details, or Self Adhesive Gas Membrane are available for sealing around protuberances.

ACCESSORY PRODUCTS

-  JUTA GP® DPC
-  JUTA GP® Tape
-  JUTA GP® Self Adhesive Membrane
-  JUTA GP® Primer
-  JUTA GP® Top Hats and Preformed Corners
-  JUTA GP® Protection Fleece
-  JUTA GP® Void Vent (25/40mm)

PLEASE CONTACT JUTA UK DIRECTLY FOR MORE INFORMATION ON JUTA GP® 5

Contact us to find out more information.
info@juta.co.uk | 01772 754177 | JUTA.CO.UK
Melton Grove Works, Church Road, Lytham, FY8 5PL

**JUTA**

riba
product
selector



Juta UK Ltd,
Melton Grove Works,
Church Road,
Lytham,
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FY8 5PL

Tel: 01772754177
Email: info@juta.co.uk
Web Site: www.juta.co.uk

Our Ref: JUTA GP® 5- New Product

28th October 2021

Dear selected customer,

The following is commercially sensitive, and is issued as confidential. This is not for general circulation.

Following current high demand for our GP® membranes, and increasing concern around the suitability and interpretation of guidance around aluminised foil membranes as gas barriers in large commercial warehousing projects (sheds) - we are accelerating the launch of our next generation gas barrier. We are always listening to market demands, and seeking to improve our product offerings, and achieve greater levels of sustainability throughout our supply chains.

GP®5 is our newest iteration of gas membrane technology, and offers an improvement over existing aluminised foil gas barriers with enhanced resistance to damage from in-situ service stress. We are releasing the GP®5 through selected long term trusted customers only - this is not on general sale, and is positioned to give specialist approved gas membrane installation companies access to new technology, and as always, keep ahead of the curve.

B58485:2015 + A1 2019 Table 7 was updated to include benchmark physical characteristics for 'gas membranes' - Notably the minimum requirement for above slab membranes (typically block and beam - housing) as 370gsm and 0.4mm thick between any scrim. As we know the biggest cause of damage to membranes is subgrade condition and follow on trades. Many of the membranes used as gas resistant membranes rely on the aluminium core providing the gas resistance - but as an industry, we have become lazy, and simply look for the <40ml value as 'compliance'. Less thought for their suitability or functionality in the application setting is occurring, and protection of the membrane is often omitted. Durability is a consideration of any design.

In an effort to improve durability and long term performance in industrial site settings, we are introducing the GP®5, as a non-aluminised proprietary gas resistant damp proof membrane, which has fewer limitations on use than the GP®1.

Please rest assured that GP®5 proposed as a proprietary gas resistant damp proof membrane, is offered as one of the most competitive compliant gas membrane on the market, reserved primarily for use through specialist installers, to ensure our end users and clients achieve the best possible standard of install, with the best possible products, at the best possible price; ensuring protective barrier systems are provided with an anticipated design service life in excess of 60 years, which is both a sustainable and cost effective method of a critical geosynthetic application such as gas protection.

Where reinforcement is placed on top of gas membranes, protecting the membrane in consideration of the site conditions would be a requirement in order for design of protective measures to be in line with B58485. The geotextile we propose (geoNETEX A PP TT 300 UVLS) is CE marked for protection, and as such can also form part of our durability statement for protective measures, such that we can provide material warranty for a design service life of at least 60 years (This is a mandated requirement of building regulations). It is worth noting, that other geotextiles on the market offered for this function - do not hold relevant CE marking for this function.



Juta UK Ltd,
Melton Grove Works,
Church Road,
Lytham,
Lancashire.
FY8 5PL

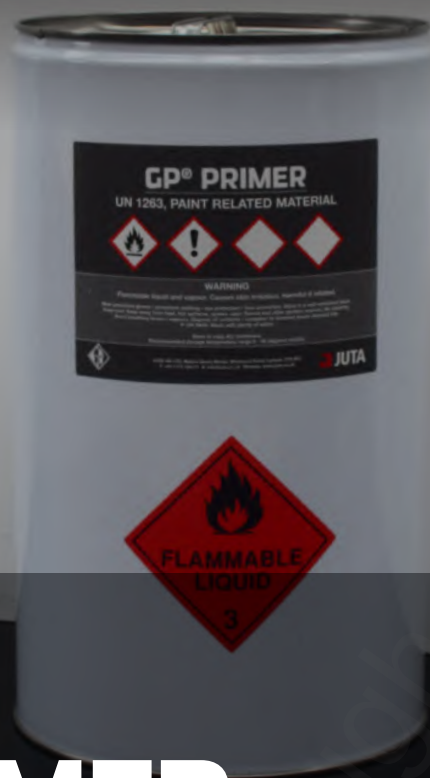
Tel: 01772754177
Email: info@juta.co.uk
Web Site: www.juta.co.uk

I attach for information our TDS, along with our LEED and REACH information and draft warranty.

I trust that this provides an acceptable solution, and maintains current demand for GP® products. Should you have any queries on the above, please do not hesitate to contact the undersigned.

Best Regards
Patrick Flood

Technical Director
JUTA (UK) LTD
(patrick@juta.co.uk)



GP® PRIMER

GP® PRIMER is a quick drying, cold applied bituminous solution designed to penetrate and seal porous surfaces prior to the application of covering materials. Conforms to BS Code of practice 144, part 3.

TITANTECH®

For developers of brownfield and contaminated sites the TITANTECH® family of products represent a major step forward in safeguarding projects against gaseous and chemical contamination.

Uses

GP® PRIMER seals porous substrates and encourages the adhesion of bituminous waterproofing systems and sheet coverings. It may be applied successfully to a wide range of surfaces:

- Concrete
- Asbestos Cement
- Slate
- Metals (mild steel, Zinc, Lead)
- Lightweight Concrete screeds

Handling

GP® PRIMER is available in 5 litre and 25 litre containers.

Storage

Storage life indefinite in tightly sealed, undamaged containers.

Health and Safety

Refer to material safety data sheet (MSDS) for a full list of hazards.

Colour	Black
Metal Surfaces	6 - 11 m ² per litre coverage
Concrete	3 - 4 m ² per litre coverage
Bituminous	5 - 8 m ² per litre coverage





Feature	Characteristics
Colour	Black
Metal Surfaces	6 - 11 m ² per litre coverage
Concrete	3 - 4 m ² per litre coverage
Bituminous	5 - 8 m ² per litre coverage
Drying Time	Allow to dry completely before subsequent installation begins. Drying time is dependent on ambient air temperature, atmospheric conditions and porosity of the substrate. Average drying time at 20°C is between 2 - 6 hours.

JUTA UK

For additional information or assistance, please contact JUTA UK directly.

Application

Apply by brush or spray. Surface should be clean, ie. free from all oil, grease, dirt, dust and loose debris. On metal surfaces all loose rust should be removed using a wire bristled brush and where advanced signs of corrosion are evident these areas should initially be treated with a rust inhibitor. Surfaces should preferably be dry although GP® PRIMER will adhere to damp but not wet surfaces. GP® PRIMER should be applied evenly across the surface in one generous coating.



GP® SAM

GP® SAM, gas protection self adhesive membrane, is a bituminous gas proof and water proof sheet, composed of self-adhesive SBS polymer modified bitumen incorporating GP® 1 with an upper surface finish of black reinforced LDPE, and a lower surface finish of siliconized release film. GP® SAM is used for the gas/waterproofing of underground structures where harmful ground gasses are anticipated, and as a self adhesive accessory to GP® 1.

Thickness	1.2 mm
Width	0.9 m or 0.3 m
Length	20 m
Weight	1100 g/m ²

TITANTECH®

For developers of brownfield and contaminated sites the TITANTECH® family of products represent a major step forward in safeguarding projects against gaseous and chemical contamination.

Handling

Roll weights can be in excess of 20 kg (approx 33 kg/roll) and hence appropriate care and equipment is required for unloading and handling. This product is non-toxic nor flammable.

Storage

Rolls of GP® SAM should be stored on in a cool, dry place, and be protected from exposure to rain, sun, heat and cold temperatures prior to installation. Exposure to sunlight for extended period of time could cause difficulty with removal of the release film.





Feature	Characteristics	Test Method	GP® SAM
Physical Properties	Thickness	EN 1849-2	1.2 mm
	Width	EN 1849-2	0.9 or 0.3 m
	Length	EN 1849-2	20 m
	Weight	EN 1849-2	1100 g/m ²
Hydraulic Press	Water Tightness	EN 1928	Pass
	Water Vapour Transmission	EN 1931	0.013 g/m ² /day
Mechanical Properties	Tensile Strength (MD/CMD)	EN 12311-2 (A)	500 N/50mm
	Elongation (MD/CMD)	EN 12311-2 (A)	> 12 %
	Resistance to Static Load	EN 12370	20 kg
	Joint Strength	EN 12317-2	> 30 N
	Durability and Water Tightness (Ageing and Chemicals) 60 kPa	EN 1847	Pass
	Resistance to Nail Tear (MD/CMD)	EN 12310-1	> 300 N
	Resistance to Fire	EN 13501	F Euro Class
Gas Permeability	Methane Permeability	EN ISO 15105-1	< 0.68 ml/m ² /day/atm
	Carbon Dioxide Permeability	EN ISO 15105-1	< 2.81 ml/m ² /day/atm
	Radon Permeability	K124/02/95	8.0 x 10 ⁻¹⁵ m ² /S
Compliance and Certification	CE Mark - EN13967:2012 + A1:2017 Type (A/T)		
	BS 8485:2015 Compliant (Methane and Carbon Dioxide Barrier)		

JUTA UK

Please contact JUTA UK Directly for more information on GP® SAM

Installation

GP® SAM should be installed in accordance with the product installation guidelines, and in accordance with BS 8485:2015, and/or BS 8102:2009.

It is recommended that GP® SAM is not applied in temperatures below 10°C, in colder weather the material can be warmed slightly to aid adhesion.

Accessory Products

- GP® Primer
- GP® Protection Board
- GP® Protection Fleece



APPENDIX D

Project Survey Sheets

Gas Protection Inspection & Validation Record

One record sheet to be completed for each plot inspected by a SUITABLY QUALIFIED independent consultant/engineer

Project Number:		Design Source Ref:		Specification Source/Ref:		Other Documents Attached	Y/N	
Site Name/Location:		Building Use:	Residential	Commercial		Other (Describe)		
Plot Numbers:		Building Description:	No. of Storeys =		Detached		Semi-Detached	
Compiled By:		Gas Protection Type	Active/Passive		Foundation Type:	Suspended Floor/Raft/Other		

Ventilated sub-floor (if present)	Inspection date/time:		Inspected by:		Photographed:	Y/N	
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Y/N	Notes/Recommendations (see guide below)
	1. Void Former Type
	2. Height of Void Space
	3. Venting Media
	4. Pipe Size & Spacing
	5. External Wall Airbricks
	6. Internal Sleeper Walls
	7. External Vent Trenches/Ducts

Gas Barrier	Inspection Date/Time:		Inspected by:		Photographed:	Y/N	
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Y/N	Notes/Recommendations
	8. Membrane Type
	9. Extent of Coverage
	10. Underside of Membrane
	11. Slab/Membrane Condition
	12. Laps & Joints

Signed:

Date:

INDEPENDENT INSPECTION & VALIDATION CERTIFICATE OF CONFORMANCE

DATE:

PROJECT NAME:

CONTRACT NO:

INSPECTION, VALIDATION & INTEGRITY TESTING DETAILS:

MembraneTestingSolutions Ltd hereby confirm that the elements of the project detailed above have been inspected and validated by a suitably qualified independent consultant in accordance with industry requirements, with the test result noted below:

CONCLUSION (PASS/FAIL)

Where the conclusion above indicates a Pass, the construction activities may proceed subject to suitable protection measures of the membrane being applied in accordance with the manufacturers recommendations.

Signed for on behalf of **MembraneTestingSolutions Ltd**

Name:

Dated:

Signed for on behalf of The Client: Name:

Dated:

Membrane Testing Solutions Limited • The Studio, Parsonage House, Parsonage Street, Halstead, Essex CO9 2JR

Telephone: 0844 557 3786 • email: sales@mtsltd.net • www.mtsltd.net



Gas Protection Verification Declaration

Site

Site Name	test2
Site Address	2 Test Street, Exampleville

GPVS Declaration Reference	0420-C5395
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Brief Description of Site

Site description goes here.

Site Type	Residential
Plot Number(s)	456 - 458

Document

Verification Report Title	test2
Verification Report Identifier	N/A
Named Client	N/A



GPVS Declaration

SGPV Details

SGPV Name	Helen McLennan
SGPV Accreditation No.	SGPV0000
Telephone	05 55 69 72 43
Email	helen.mclennan@claire.co.uk
Organisation	Testers Ltd
Address	10 Testing Road, Little Testing, TF5 1GR

Declaration

I, Helen McLennan, confirm that I am the person described in the SGPV Accredited Person details section and hold a current valid registration as a SGPV Accreditation No. SGPV0000 under the Gas Protection Verification Accreditation Scheme.

I have reviewed the verification report described in the Document Details section and I am satisfied that:

1. The work has been carried out to an acceptable standard.
2. The work has been verified by suitably experienced and qualified personnel.
3. The level of verification is proportionate to the level of risk identified in the Site Investigation report/Gas risk assessment.
4. The interpretations and conclusions are reasonable.
5. The verification strategy is in line with industry guidance.
6. I am competent to sign this Declaration and that
 - a. I am fully aware and comply with the Scheme's Code of Conduct
 - b. The work of this review and Declaration are within the limits of my knowledge, competence and professional capacity.

Note: The document that has been reviewed was prepared by the organisation named for the benefit of the named Client who has reliance upon it. Any professional liability arising from any proven negligent act or omission by the Company carrying out the work and publishing the document rests with that Company and not with the GasA Registered Person or the GPVS.

Signed:

Date:

Name:

[Block capitals]



0420-C5395