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Geological & Geotechnical Consultants

Dewsbury & District Hospital
Groundworks Discovery & Remediation Strategy
(September 2025)

Prepared for Darwin Group Ltd

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1 Introduction

1.1 Introduction

Key GeoSolutions Ltd (KGS) has been commissioned by Darwin Group (the Client) to prepare a 'Discovery & Remediation Strategy' to deal with the risk of encountering any unforeseen contamination during the groundworks relating to the construction of a new single storey modular building, approx. 30m wide x 50m long, to accommodate operating theatres, patient accommodation, bathrooms, waiting areas office areas and staff space.

The proposed location of the new building is within the Dewsbury & District Hospital grounds, adjacent to the existing Boothroyd Centre, approximately centred at National Grid Reference 423224mE, 422777mN.

The nature of the ground conditions at the Site are based on the findings of the KGS Phase 1 & 2 Ground Investigation Report, October 2023 (report reference 9202-001-R01-2).

1.2 Development Proposals

The proposed development involves the removal of the existing car park and the access ramp into the Boothroyd Centre followed by the construction of a single-storey building. The following drawings show the as constructed development (included as Appendix 1):

- Site Plan:
 - 180598-DGL-01-00-DR-A-1160-(CR2)-Proposed Site Plan
- General Arrangement
 - 180598-DGL-01-ZZ-DR-A-2000-(CR2)-General Arrangements
- Proposed Building Sections
 - 180598-DGL-01-XX-DR-A-2300-(CR2)-Proposed Building Sections
- Elevations
 - 180598-DGL-01-XX-DR-A-2100-(CR2)-Elevations
- Landscaping Plan
 - 180598-DGL-01-XX-DR-A-1402-(CR2)-Proposed Landscaping

The groundworks are to comprise a reduced level excavation of up to approximately 0.5mbgl across the footprint of the proposed building and up to approximately 2.0mbgl in areas where strip footing and mass concrete pads are present. This will include the excavation of service trenches for; electricity, telecommunications and drainage, and the replacement of the upper 600mm of Made Ground in soft landscaped areas with clean material.

1.3 Reasons for the Document

This report presents the Discovery & Remediation Strategy for the development. It builds on and supplements the following documents:

- Combined Phase 1 Desk Study & 2 Report on Ground Investigation, October 2023, by KGS (report reference 9202-001-R01-2)

It sets out the practical steps to be taken to ensure, if contamination is encountered during the groundworks it is dealt with appropriately to ensure the site is suitable for the proposed use, and any arisings are managed and disposed of safely. The procedures for verifying that these steps have been implemented, an evaluation of the effectiveness of such actions, together with an identification of residual risks and requirements for long-term monitoring are included.

The report has been prepared in general accordance with the Environment Agency's (EA) guidance CLR11 Model Procedures for the Management of Land Contamination (Defra & Environment Agency, 2004).

The KGS report identified that within the Made Ground, Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(a)pyrene, Dibenz(ah)anthracene and Chrysene were above the screening values for residential land without home grown produce. No asbestos was identified in any material.

The KGS report concluded that the Made Ground soils are unlikely to be a suitable growing medium, and that imported soil will be required in areas of soft landscaping. The report recommended that "any areas of soft landscaping should have any Made Ground underneath removed and replaced with clean fill material or have additional testing to ensure any contaminants do not exceed acceptable limits for soft landscaped areas."

As a result, the Local Authority are seeking a Discovery & Remediation Strategy and associated methodology for validation testing and verification reporting.

1.4 Scope of the Discovery & Remediation Strategy

This strategy covers the following items:

- Inspecting and testing area(s) where the existing investigation has identified a risk of contamination being present.
- Identifying and dealing with previously undiscovered contamination.
- Verification of soil and/or aggregates being imported to site.

In accordance with good practice this document also provides:

- A summary of the site context.
- Screening criteria in the event of contamination having been encountered.
- Processes to demonstrate that those objectives have been achieved.
- Contact details for principal stakeholders.

1.5 Assumptions and Limitations

This document solely relates to the proposed development and should not be used to address land contamination risks associated with other phases of development at the site or development on other sites. Implementing the procedures in this document is the responsibility of the Contractor(s).

The recommendations in this document are based on the ground conditions encountered during the ground investigations undertaken by KGS for the proposed building, including the results from laboratory tests.

The materials observed and tested during the site investigation represent only a small proportion of the materials present on the site. There may be other conditions prevailing that have not been revealed and which therefore have not been taken into account. The Discovery & Remediation Strategy is designed to address this issue.

This should be treated as a working document and, as such, may need to be revised in the event that previously undiscovered ground conditions are found during the earthworks. The Contractor(s) should consult the Client's Geo-environmental Adviser before taking action as the new findings may affect the recommendations currently made and further measures may be needed. The Local Planning Authority should also be informed, see Section 3.4.2 for details.

The comments made on gas and groundwater conditions are based on observations made during the site investigation and the limited monitoring programme. It should be noted that gas concentrations and groundwater levels may be influenced by a number of factors.

The information, views and conclusions made are based, in part, on information supplied to KGS by others. KGS has proceeded in good faith on the assumption that this information is accurate. KGS accepts no liability for any inaccurate conclusions, assumptions or actions taken resulting from any inaccurate information supplied to KGS by others.

2 Summary of Site Conditions

2.1 Site Location & Description

The site is located at Dewsbury & District Hospital, which is managed by the Mid Yorkshire Hospitals NHS Foundation Trust. The site is located at National Grid Reference 423224mE, 422777mN.

The site is currently a car park and is bounded to the north by a plant room, to the south by Fitton House (Hospital residential building), to the west by the Boothroyd Clinical Centre and to the east by an access road and existing car park.

The site is relatively flat at levels sloping gently to the east from approximately 98.5 to 98.0mAOD, with the Boothroyd Centre being approximately 1.5m higher than the current car park level. The majority of the site is covered with asphalt, with a small amount of soft landscaping along the western border.

2.2 Brief Site History

The KGS report summarises the site history as follows:

- 1855 – Agricultural Land.
- 1894 – Part of Staincliffe Colliery (Disused).
- 1907 – Building constructed on site as part of the Dewsbury Union Workhouse.
- 1922 – Building change of use to Staincliffe Institution.
- 1955 – Building change of use to Staincliffe General Hospital.
- 1972 – Hospital developed further with 1907 buildings being replaced.
- 1996 – Development of Boothroyd Clinical Centre.

2.3 Summary Findings of Ground Investigations

The ground investigation carried out by KGS comprised of two phases:

Phase one consisted of six windowless sampling boreholes (WS01, 02, 03, 04, 05, 06), to a maximum depth of approximately 2.4mBGL, and two trial pits (TP01A, 01B) that were also used for soakaway testing. All of the window samples holes were installed with water and gas monitoring wells.

Phase two consisted of seven rotary boreholes (RH01, 02, 03, 04, 05, 06, 07), all to a depth of 10mbgl, and were undertaken to assess the coal mining risk on the site.

2.3.1 Encountered Ground Conditions

The site investigation encountered Made Ground, underlain by weathered mudstone and finally the mudstone bedrock. The mudstone is understood to be the Pennine Lower Coal Measures [PLCM].

The majority of the site is covered by asphalt, below which there is Made Ground. The Made Ground was up to a maximum of 2.0m thick (RH02), generally comprising a mixture of sands, gravels, clays with various anthropogenic materials.

The weathered mudstone was found to be up to a maximum of 1.4m thick and is described as being “firm orangish brown and light grey mottled CLAY”.

The mudstone bedrock was encountered between 97.0 and 96.0mBGL, comprising extremely weak to very weak mudstone. No coal or voids were encountered.

2.3.2 Groundwater

Although groundwater was not encountered in the windowless sample boreholes, or the trial pits during the Phase one ground investigation, groundwater was recorded in the Phase two ground investigation, between 3.0 – 3.35mBGL within rotary boreholes RH01-RH06.

Groundwater monitoring in the six windowless sample boreholes as part of the ground gas monitoring visits between 26th April and 23rd August 2023 shows the water level to fluctuate from a highest level of 0.98mBGL within WS05 to a lowest level of 1.98mBGL within WS06.

2.3.3 Ground Contamination

The KGS report compared the environmental chemistry soil results to generic assessment criteria for a Residential without Home Grown Produce end-use scenario. This identified exceedances of Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(a)pyrene, Dibenz(ah)anthracene and Chrysene within one sample of the Made Ground within TP01B. No samples recorded the presence of asbestos.

The results of an initial screening for the suitability of the material for off-site disposal showed that no contaminants exceeded the Waste Acceptance Criteria (WAC) for inert landfill waste.

The potential aggressivity of the clays of the weathered PLCM was assessed in accordance with the requirements of BRE Special Digest. The test results indicate that the Design Sulphate class for the soil is DS-1 and the Aggressive Chemical Environment for Concrete (ACEC) class is AC-1s.

2.3.4 Ground Gas

The site lies in a Coal Authority Coal Mining Reporting Area and the KGS report identified a risk posed to the site from shallow mine workings and mine gases. The report also identified a risk from ground gases due to deep Made Ground.

Gas monitoring wells were installed in all six of the windowless sample boreholes and monitored over a period of four months between 26th April and 23rd August 2023. The results of this monitoring are summarised in KGS gas monitoring summary report, August 2023 (Ref. 9202-002-R-01) in which the site was characterised as being CS2 and would require appropriate protection measures.

The KGS report also highlighted that the site is located within an intermediate probability radon area (5-10% of homes are estimated to be at or above the action level.) and that the UK Government website recommends that basic radon protective measures are undertaken.

2.3.5 Recommendations

The KGS report made the following recommendations:

- Where Made Ground is present below any proposed area of soft landscaping, the Made Ground should be replaced with clean fill material or tested to ensure any contaminants do not exceed acceptable limits for landscaped areas.
- The proposed building should be designed with appropriate gas protection measures.
 - The location of the proposed building at Dewsbury & District Hospital is characterised as CS2.
 - The UK Radon Government website recommends that for sites in the 5-10% risk band that basic radon protective measures are implemented.
- Construction risk assessments and method statements will need to account of the presence of contamination in the Made Ground, and vigilance should be maintained in particular to the potential presence of hydrocarbon related contamination associated with the sites current use as a car park and the diesel generator.
 - When excavating ground adjacent to the diesel generator it should be ensured that any ground impacted by any leakage is fully excavated and replaced with clean material.
- Normal standards of health, safety and hygiene should be observed during construction.
- Consultation with the local water supplier is recommended in order to confirm appropriate measures for mitigation stress cracking and/or permeation of due to the presence of contamination within the Made Ground.
- Good practice should be employed in order to limit amount of surface water entering the excavation area.

Based on the following factors that a simple cover system will be appropriate for the site in areas of soft landscaping over the existing Made Ground:

- Low levels of contamination previously encountered and expected on-site.
- The site use continuing to be hospital buildings and car parks.
 - With limited soft landscaping and no home-grown produce
- Groundwater not being within upper few metres of ground surface.
- Very low probability of larger burrowing animals (e.g. rabbits & badgers)

It is recommended by that, in areas of soft landscaping over the existing Made Ground, the imported clean capping layer is to be a minimum of 600mm thick, with a geotextile separator layer between the Made Ground and the imported soils (See schematic detail in Appendix 4). The imported soils shall comply with the recommendations in Section 3.7 of this report.

3 Remediation & Discovery Strategy

3.1 Remediation Objectives

Remediation objectives are site-specific objectives that relate solely to the reduction or control of risks associated with one or more relevant pollutant linkages (Defra & Environment Agency, 2004). The principal remediation objectives are considered to be:

- Implement the Inspection and Discovery Strategy during groundworks to identify and manage potential land contamination risks.

3.2 Site Clearance

3.2.1 Recent/proposed Activity

The proposed Site Enabling Plan for the works (180598-DGL-01-XX-DR-A-1175-(P1)) is provided in Appendix 2.

The groundworks are to comprise a reduced level excavation of up to approximately 0.5mbgl across the footprint of the proposed building and up to approximately 2.0mbgl in areas where strip footing and mass concrete pads are present. This will include the excavation of service trenches for; electricity, telecommunications and drainage, and the replacement of the upper 600mm of Made Ground in soft landscaped areas with clean material. Any Made Ground removed will be disposed of off-site.

3.2.2 Protecting or Decommissioning Redundant Monitoring Wells

There are six known monitoring wells within the site area. Once all the required gas monitoring has been completed, due to their locations below the footprint of the building, these boreholes will require decommissioning at the start of the groundworks to ensure that they do not form preferential pathways for contaminant migration into the underlying strata which are Secondary A Aquifers.

A suitable Monitoring Well Decommissioning Method Statement shall be produced for the decommissioning of all six monitoring wells. This document should reference the October 2023 Ground Investigation report by KGS, and the document entitled 'Good Practice For Decommissioning Redundant Boreholes and Wells', produced by the Environment Agency (EA) in October 2012.

3.3 Supervision of Groundworks

The Contractor will supply a suitably qualified Engineer/Scientist to direct and supervise the works. The Engineer/Scientist shall have a minimum of three years' experience of contaminated land and earthworks projects and shall be responsible for:

- Taking photographs and tracking the movement of site materials.
- Identifying, sampling and assessing test results for suspect materials.
- Directing the separation of excavated materials and classification.
- Keeping records for materials retained and removed from site.
- Directing the filling and compaction of excavations where this is necessary to restore levels.

3.4 Inspection and Discovery Strategy

3.4.1 Outline Approach

Arisings during the groundworks will be inspected continuously to identify previously undiscovered ground conditions and/or potentially contaminated soils. In addition, particular care will be paid to any excavation that will take place around the location of the existing diesel generator to the north of the site for evidence of hydrocarbon contamination.

All operatives and groundworkers should remain vigilant for unforeseen or suspicious ground conditions. Initial identification should be based on visual and or olfactory assessment. General indicators of possible contamination could be arisings that quickly change appearance or appear inconsistent with the general soil mass (see below). Examples could be oily (or free phase) pockets, fibrous materials, strong odours or vibrant colours associated with the soil itself, but also physical foreign objects such as cement board, ash, brick, concrete, glass and rubbish.

Vigilance shall be maintained for materials suspected of exceeding the hazardous waste thresholds. Physical contaminants such as potential Asbestos Containing Material (ACM) or other Man-Made Mineral Fibres (MMMMF) should be treated as hazardous until proven otherwise.

The findings of the investigations are a guide to baseline ground conditions. Typical descriptions of site soils, extracted from the KGS Ground Investigation Report are presented in Table 1.

Table 1 - Description of Baseline Ground Conditions

Stratum	Average Thickness (m)	Typical Description
Made Ground	c.0.3 -1.5m	Surface cover of concrete or bituminous macadam Over Brown sandy gravel consisting of brick, asphalt, and ash And/or Grey mottled dark grey sandy gravelly clay with brick and coal fragments.
Weathered Bedrock	c.1.4m	Completely weathered to extremely weathered MUDSTONE, recovered as soft stiff orangish brown and grey mottled clay. [Pennine Lower Coal Measures Formation]
Bedrock	Unknown	Extremely weak mudstone progressively getting stronger with depth [Pennine Lower Coal Measures Formation]

In the event that suspicious ground conditions i.e. potential contamination 'hotspot' are identified then the management sequence summarised in Section 3.4.2 will begin. Potentially impacted soils shall be dealt with separately to the bulk natural soils, as described in Section 3.5.2 below.

3.4.2 Management Sequence for Unexpected Contamination

The following sequence should be adopted for managing suspicious ground conditions:

- a) Suspicious ground conditions are identified by groundworker(s) and the works are halted;
- b) Contractor assesses the requirement for any additional health and safety or environmental management control measures, which are then implemented to control potential risks.
- c) Contractor notifies the Client's Contract Administrator and Geo-environmental Consultant.
- d) Contractor's Engineer/Scientist records the extent of 'contamination' and nature of stratigraphy.
- e) Findings are discussed with the Client's Geo-environmental Consultant and a way forward is ascertained e.g. sampling and testing requirements, special measures required during excavation etc;
- f) Engineer/Scientist collects samples and schedules agreed laboratory analysis.
- g) Details of samples collected, and tests scheduled are recorded within (d).
- h) Client's Geo-environmental Consultant notifies Local Authority and provides copy of record made within (d).
- i) Test results returned to the Client's Geo-environmental Consultant for review.
- j) Remedial action, if necessary, and programming of the works are agreed with the Local Authority.

- k) Contractor informed of remedial action required and Method Statement prepared.
- l) Method Statement agreed by Client's Geo-environmental Consultant, works proceed and Method Statement forwarded to Local Authority for their records.

3.5 Groundworks

3.5.1 General Activity

The principal tool for managing the groundworks will be this document, together with the approved planning drawings and the foundation design. The excavated natural soils will either be retained within the site planning boundary and placed as compacted fill and/or disposed of off-site. All Made Ground excavated will be disposed of off-site.

3.5.2 Impacted Soils

Based on the findings of the KGS ground investigation, the likelihood of encountering soil impacted by contaminants is considered to be low, with the exception of the asphalt cover (see Section 3.2.1) which will be excavated and disposed of off-site separately.

The contaminants identified during the KGS ground investigation above the screening values for residential land without home grown produce within the Made Ground were Polyaromatic Hydrocarbons (PAHs) comprising of; Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(a)pyrene, Dibenz(ah)anthracene and Chrysene. Additionally, no asbestos was identified visually or in any material tested.

Notwithstanding this, a series of contingency arrangements will be in place for dealing with suspicious ground conditions (see Section 3.4.2).

The Inspection and Discovery Strategy (Section 3.4) is used to identify materials that are characteristically different from the bulk arisings. Impacted soil shall be chased out laterally and vertically by mechanical excavation until visual and/or olfactory inspection suggests impacted material no longer remains in-situ. Vertical excavation should proceed progressively with the objective being to separate the potentially unacceptable material from that above, thus initially helping to minimise the generation of unacceptable material.

The discovery and management of potentially impacted soils should be dealt with on a case-by-case basis in order to address the specific nature of ground conditions uncovered. In the event that the 'baseline' strategy for the management of such soils is considered adequate then it is expected that the excavation works could proceed using a conventional delineation exercise. It should be noted however that the ground conditions uncovered could require additional health and safety and environmental control measures before the works can proceed.

An example of the sampling and testing requirements for a suspected contamination hotspot is given in Verification Strategy (Appendix 3). This would typically comprise two elements:

- Characterise 'hotspot' and assess suitability for reuse/waste classification by sampling and testing the impacted soil.
- Demonstrate that impacted soils have been removed from the surrounding 'clean' soil by sampling and testing the sides and base of the excavation i.e. the soil that appears to be not impacted by means of inspection.

Arisings from the 'hotspot' should be excavated (providing that in doing so no unacceptable risks would be posed) and temporarily stored in a 'quarantine' area.

Arisings that are considered unacceptable for reuse by visual or olfactory inspection alone should be excavated (providing that in doing so no unacceptable risks would be posed) and temporarily stockpiled in a separate 'quarantine' area. Sampling and testing should be carried out to satisfy the requirements of the waste management facility that will be accepting the material. Any arisings emitting strong odours or containing ACM should be removed from site as soon as possible.

3.6 Excavation, Handling, Temporary Storage and Disposal of Arisings

During the excavation works the Contractor shall ensure:

- Exposed soils and skips are covered when not being worked on.
- All exposed soils are subjected to dust suppression (water or cover) particularly over weekends where soils are either kept moist by sprinkler or covered by tarpaulin.
- Surface water entry into excavation is minimised as much as possible by diverting run-off away from the edges.
- Minimise the temporary storage of excavated arisings on-site wherever possible without compromising the waste Duty of Care.
- The Groundworks Sub-Contractors site Engineer/Scientist oversees all excavations so the excavation and segregation of different categories of waste soils can be directed as they arise.
- If suspected hazardous soils are encountered, they are prevented from being mixed with non-hazardous wastes.
- Stockpiles do not exceed the height of the boundary fence.
- Stockpiles are kept damp and covered but silty water run-off and erosion is prevented.
- Stockpiling of soils shall be undertaken to prevent the spread of contamination and shall include:
 - Where contamination is present, or suspected of being present, the use of containment e.g. use of hard surfacing, binding, keeping damp and covering or use of solid lockable skips with solid bases.
 - Preventing any liquid wastes leaching from bins or skips.
 - Cleaning of any skips, storage areas etc. on completion of the works.
- The selected waste haulage company and ultimate disposal point are authorised to take the type of waste soils being generated.
- All arisings going off site shall be in covered vehicles or covered skips.

- That the waste soils shall only be transferred to authorised persons and companies with the appropriate Duty of Care documentation, i.e. completed waste transfer notes or consignment notes for hazardous waste for each load of waste removed from the site.

Characterisation of waste soils is the responsibility of the Contractor. It is recommended that the waste management facility is consulted to ascertain their testing requirements. Analytical data shall be made available to that facility and the haulier. As indicated in Section 3.2.1, asphalt cover will be excavated and disposed of off-site separately to other materials. Further analysis may be required to provide sufficient information to classify all the arisings and enable the waste generated to be managed appropriately and comply with the waste Duty of Care.

All materials removed from site will be transported in vehicles, under appropriate duty of care, to a waste management facility permitted to accept the category of waste being disposed. The haulier will be a permitted waste carrier and will provide evidence of registration before removal of any consignment. A record of all vehicle movements and consignments are to be kept and retained by the Contractor for a minimum of two years. This will comprise date of transport, vehicle registration, duty of care number, load weight, references of corresponding analytical results and any other data required by the Environmental Protection Act 1990 and all subsequent amendments. All waste records shall be provided to the Client's Geo-environmental Consultant as part of the package of information required to prepare a Verification Report (Section 4).

Waste will be deposited at the management facility during the operating hours of that site on the same day as it is loaded i.e. no overnight standing of loaded trucks away from site. In the case of mechanical breakdown or other such emergency that prevents the unloading and disposal of the waste on the same day as it is loaded, a loaded truck should be parked overnight in a secure manned compound. The Contractor shall be liable for transportation of the loaded truck to the secure compound, for overnight security and for the immediate unloading of the loaded truck and disposal of the waste as soon as practicable on the following day.

Further information on the waste duty of care can be found in the revised code of practice published by DEFRA which can be downloaded at;

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/506917/waste-duty-care-code-practice-2016.pdf

3.7 Importing "Clean" Material

Imported soils and aggregates shall comply with the following:

- Imported soil must comply with the requirements of BS3882:2015 Specification for Topsoil and shall be free of propagules of aggressive weeds, fragments of glass, bricks, concrete, wire or other potentially hazardous foreign matter and bulk vegetative growth.

- Tests selected for chemical suitability shall be determined based on the nature and source of the imported soils.
- Testing shall be carried out to laboratory detection limits that are below the relevant S4UL detection limits below by the named laboratory with MCERTS and UKAS accreditation for the tests required unless otherwise agreed with Client's Geo-environmental Advisor.
- It shall not contain contaminants which exceed the published LQM/CIEH Suitable for Use levels (S4UL) for human health risk assessment for a residential without plant uptake (these are based on a sandy loam and 2.5% SOM and are considered suitable for screening soil imports).
- It shall not contain lead above the published DEFRA Category 4 Screening Level.
- It shall be free from visible ACM and to not contain asbestos fibres in excess of 0.001% exceed and the selected testing laboratory shall have achieved a satisfactory rating in the last three
- It shall meet the criteria of BRE Special Digest 1 for Class 1 Sulphate conditions; and
- In any potable water supply service trenches in addition to the above the backfill shall be below the thresholds where plastic water supply pipes would no longer be suitable as set out in the UK Water Industry Research (UKWIR) "Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites" (Ref 10/WM/03/21).

Testing may be necessary to demonstrate that such materials are also suitable from an engineering perspective.

Any material to be imported to site shall be obtained from a reputable supplier and the Contractor shall provide evidence of the provenance of all imported soils, including chemical test data to the satisfaction of the Client's Geo-Environmental Advisor prior to importation. Any material to be imported to site shall be obtained from a reputable supplier and shall have ceased to be a waste. There would be a requirement to obtain a permit or an exemption under the Environmental Permitting (England and Wales) Regulations 2016 or be working in accordance with an End of Waste Protocol if non-site won materials that have been classified as a waste are imported.

3.8 Ground Gas

The proposed building at the site required gas protection measures to be installed. Based on the results of the gas monitoring undertaken by KGS (Report Ref. 9202-002-R-01-0) the site should be characterised as Characteristic Specification (CS) CS2 and requires appropriate gas protection measures.

Darwin have supplied KGS with a gas protection measures verification plan (Report Ref. GEO104074) for the proposed development written by GeoShield Ltd (GeoShield), which is included in full in Appendix 5 of this report. The GeoShield report provides a gas protection design and a pre-verification plan reviewing the proposed design, confirming that the design is compliant with developer and planning authority requirements and in accordance with BS8485:2015 + A1 2019¹. The report should be used as

¹ British Standard 8485:2015 + A1 2019 - Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings.

the verification plan for the gas protection measures as it outlines the details of all items required for the testing in accordance with CIRIA735² and validation of the gas protection measures.

In summary the GeoShield report states the following:

- In accordance with BS8485:2015 + A1 2019 the building should be classified as a Type B building and must conform to a CS rating of 2. Therefore, it will require a minimum gas protection score of 3.5 points.
 - This will be achieved by installation of:
 - A specific gas resistant membrane design (2.0 points) and,
 - A structural barrier of concrete pad foundations with a large passive subfloor void connected to airbrick for ventilation provisions (1.5 points).
- Due to elevated Radon potential (Maximum Radon potential is 5-10%) Basic Radon protection measure are required.
- The plan confirms how the installation will be tested in accordance with CIRIA735 and outlines the details of all items required for the validation of gas protection measures.

² CIRIA735 - Good practice on the testing and verification of protection systems for buildings against hazardous ground gases

4 Record Keeping and Verification

4.1 Introduction

This section describes the information that needs to be collected to demonstrate that the remediation objectives have been achieved. This is typically factual records collected during the works, which are then collated to produce a Close Out Report, and in broad terms may consist of:

For the Implementation of the Discovery Strategy

- Supervising Engineer's field notes and photographs of contamination encountered during the works (if applicable).
- Drawings and photographs showing layout of the site during works e.g. excavation areas, stockpiles.
- Records of additional sampling and testing for waste classification and waste acceptance criteria.
- Supplier details, volumes/tonnage of imported soils, validation test results and evidence that it has ceased to be a waste or additional waste management requirements to deposit waste in the permanent works.
- As-built drawings showing extent of excavations; and
- Duty of Care Records for disposal off-site including completed waste transfer notes and/or hazardous waste consignment notes; waste haulier waste carrier registration; evidence that final destination is a legal waste disposal site with the necessary approvals in place to take the waste soil arisings; and evidence that the waste soils were taken to the named waste disposal destination.

If suspicious or impacted soils are encountered, then the following additional records are likely to be required:

- Analytical data, records of quantities and chain of custody documents for soils removed from, retained at (including moved around) and imported to site.
- Analytical data obtained from verification tests on soils.
- Datasheets, specification sheets, "as-built" drawings or similar for building materials or systems that have been specified to mitigate the effects of the ground conditions.
- Evidence of compliance with consents, licenses, permits or other authorisations using monitoring data or other records.
- Evidence of correspondence with the regulatory authorities.
- Drawings showing the vertical and lateral extents of contamination encountered, positions of stockpiles, buried obstructions removed, verification sampling positions, vertical and lateral extents of imported and reused material.
- Exploratory hole records for excavations made as part of the remedial works.

4.2 Roles and Responsibilities

The principal parties involved in the management of the proposed groundworks are provided in Table 2.

Table 2 - Details of Contractors Relevant to the Groundworks

Party	Role	Responsibility
Principal Contractor – Darwin Group Ltd		
Construction Manager <i>Matthew Foster & Nikaloas Davelis</i>	<p>Overall management of project execution.</p> <p>Management of subcontractor interfaces.</p> <p>Ensure Implementation of the Groundworks Method Statement and Discovery Strategy and keeping of daily diary.</p> <p>Submission of daily diary to Kirklees Council for sign-off of works.</p>	<p>Coordination of all works by all subcontractors.</p> <p>Planning and scheduling of works.</p> <p>Management of planned and unplanned activity on-site.</p> <p>Implementation of emergency response plans and related actions.</p> <p>Provide as-built drawings and information including advising the duty holder of any residual asbestos risks i.e. asbestos encountered in excavations but not removed so the asbestos register can be updated.</p>
Site Manager <i>Nikaloas Davelis & Jason Pugh</i>	<p>Supervision of subcontract activities on site.</p> <p>Ensure that site team and all subcontractors are aware of Groundworks Method Statement and Discovery Strategy.</p> <p>Ensure completion of daily diary with respect pollution observation.</p>	<p>Day to day supervision of subcontractors.</p> <p>Day to day coordination of subcontract activity.</p> <p>Supervision of scheduled activities.</p> <p>Ensure that all subcontractors receive Environmental induction, including understanding of key impacts and mitigation measures and the Site Waste Management Plan (SWMP).</p>

Party	Role	Responsibility
<p>Waste Champion</p> <p><i>EvaBuild / Nikaloas</i></p> <p><i>Davelis / Jason Pugh</i></p>	<p>Manage all aspects of compliance with the Duty of Care.</p>	<p>Undertake routine site inspections.</p> <p>Follow the occasional lorry.</p> <p>Manage all aspects of compliance with the Duty of Care.</p> <p>Maintain waste records.</p> <p>Undertake Duty of Care checks for all controlled and Hazardous wastes – Carriers and Permitted / Exempt sites.</p> <p>Verify documentation.</p>
Groundworks Contractor – EvaBuild Ltd		
<p>Project Manager</p> <p><i>Steve Andrew – Contracts Director</i></p> <p><i>Pete Ellis – Assistant Project Manager</i></p>	<p>Overall management of groundworks project management.</p>	<p>Coordination for the contract with Principal Contractor to include:</p> <p>Management of the groundworks to the Specification and Groundworks Method Statement and Discovery Strategy, in accordance with requirements.</p> <p>Provision of a remediation statement on completion of the project.</p>
<p>Site Engineer/Scientist (see Section 3.33.3)</p> <p><i>EvaBuild and Nikaloas</i></p> <p><i>Davelis / Jason Pugh –</i></p> <p><i>Chris Thompson (Site engineer)</i></p>	<p>Site set up and implementation of Groundworks Method Statement and Discovery Strategy.</p> <p>Keeping site manager informed daily of any observations of pollution.</p>	<p>Day-to-day management of the groundwork activities and conformance with design.</p> <p>Production of site set up, original and final levels, execution of the Groundworks Specification.</p> <p>Inspection of groundworks activities.</p>

Party	Role	Responsibility
		<p>Recording any visual or olfactory evidence of contamination.</p> <p>Identification of issues including off-specification or contaminated materials.</p> <p>Verification of conformance with design.</p> <p>Audit activities associated with the execution of the Groundworks Specification and Verification Statements.</p>
<p>Haulier <i>Edwards Excavations</i></p>	<p>As a carrier / broker to remove or arrange to remove inert, non-hazardous or hazardous soils.</p>	<p>To provide permit or exemption before removal of waste from site.</p> <p>To provide Duty of Care Compliant Waste transfer notes.</p>

Table 3 - Details of Stakeholders

Party	Role	Responsibility
<p>Kirklees Council</p>	<p>Planning Authority – Development Control.</p>	<p>Provide regulatory signoff of planning condition associated with land contamination risks.</p> <p>Contact Point in the event of encountering unexpected contamination (see Section 3.4.2)</p>
<p><i>Not Yet Appointed</i> <i>(To be confirmed when additional testing is required)</i></p>	<p>Analytical laboratory (appointed by Contractor and note qualifications in Section 3.7).</p>	<p>Undertake analysis of samples as required by the Contractor(s).</p>

Party	Role	Responsibility
<i>Not Yet Appointed</i>	Geo-environmental Advisor	<p>Visit site on a weekly basis during groundworks.</p> <p>Liaise with regulatory authorities on matters of land contamination.</p> <p>Advise on the implications if unexpected contamination is encountered that necessitates changes in working methods.</p> <p>Produce Remediation Strategy and Verification Plan if required as a result of encountering unexpected contamination.</p> <p>Prepare Close Out Report if Remediation Strategy implemented or provide a Post Works Close Out letter for the implementation of the Discovery Strategy containing records listed in Section 4.1</p>
<p>Ground Gas Protection Measures Verification</p> <p><i>GeoShield Ltd</i></p>	Provide verification of installed Ground Gas Protection Measures as outlined in the GeoShield Verification Plan (Ref. Geo104074)	To provide verification evidence of installed Ground Gas Protection Measures

4.3 Verification Strategy

CLR11 (Defra & Environment Agency, 2004) defines verification as “the process of demonstrating that the risks have been reduced to meet remediation criteria and objectives based on a quantitative assessment of remediation performance” (Environment Agency, 2010).

4.3.1 Method Statement

The Contractor is responsible for preparing a Method Statement for each element of the proposed Discovery Strategy. Each Method Statement should be provided to the Client's Geo-environmental Adviser at least 14 days prior to commencement of the works for review and commenting. As a minimum the Method Statement should provide details to address the following matters:

- Measuring, recording, and assessing visual and olfactory evidence of contamination.
- Method of collecting and describing samples.
- Procedures for cleaning equipment.
- Storage of samples and transportation to the laboratory and turnaround times.
- Strategy for dealing with non-compliance issues.
- Health and safety and environmental management equipment and procedures.
- Reporting of field and laboratory results.
- Contact details of site personnel.

4.3.2 Verification Sampling and Testing

The schedule for verification sampling and testing based on the current understanding of the ground conditions is included as Appendix 3. The schedule also identifies the procedures that will be adopted to verify that remediation has been implemented.

In the event that unexpected or suspicious ground conditions are encountered the Contractor will consult the Client's Geo-environmental Consultant for guidance, as required by the Inspection and Discovery Strategy (Section 3.4).

Targeted sampling will be required in the event that visual or olfactory evidence of possible contamination is identified. These should not be incorporated into any composite samples but labelled and tested separately.

All Made Ground is to be removed from site and to be disposed off-site via the correct Duty of Care procedures and is not to be reused on-site.

The supervising Engineer/Scientist is responsible for ensuring a sufficient quantity of soil is collected for each sample to enable analysis of all parameters. It is expected that each environmental soil sample should comprise, as a minimum:

- 1no. 1lt (or 2no. 500ml) amber glass jar.
- 2no. 1lt air-tight plastic tub.
- 1no. 40ml amber glass vial.

Once taken, samples shall be stored in the dark between 2°C and 4°C and shall be couriered in cool boxes to the testing laboratory within 24 hours.

Asbestos screens and identification should be performed on bulk bag samples rather than on one, or a combination of, the above containers.

Asbestos screening in soils and other materials shall be undertaken by a laboratory holding the appropriate UKAS accreditation for the determination of asbestos fibres in bulk materials and shall be capable of identifying asbestos at a Limit of Detection of 0.001%. If the testing is to inform waste disposal purposes any subsequent quantification analysis a limit of quantification of 0.1% shall be acceptable. For human health risk assessment purposes, a quantification level of at least 0.001% shall be required.

The verified laboratory test results sheets shall include:

- Location of sample, including depth where necessary.
- Unique sample code or reference.
- Date/time sample taken.
- Name of laboratory including sub-contract laboratories.
- Date sample analysis completed.
- Parameter analysed, including whether sample preserved or stabilised on site.
- Whether analysis carried out on a dried or “as submitted” basis.
- Result of analysis must be reported on a dry-weight basis.
- Other relevant comments such as visual characteristics of the sample and other pre-treatment.
- Chromatograms where appropriate.
- Method of analysis and details of any accreditation.
- MCERTS non-conformance sheets.

4.4 Remediation Criteria

Remediation criteria are to be set and agreed with the Local Authority if significant contamination is identified which has not been mitigated completely by the foundation excavations being undertaken to enable the building to be erected and the removal of pathways by covering of the ground with hardcover.

4.5 Verification Report

4.5.1 Purpose of the Report

If the Discovery Strategy does not encounter suspicious / and or impacted soils that require remedial actions to be taken, then a verification letter will be provided with records of the inspections and corroborating lines of evidence (see Section 4.1 on record keeping and Section 4.5.2).

A Verification Report will be prepared in the event the remedial works are required and will provide the evidence to demonstrate compliance with the remediation objectives. In addition, the report will provide evidence of Duty of Care and compliance with regulatory requirements for the remedial works such as

Environmental Permitting, Consent to Discharge and any other licences considered appropriate to the execution of the works.

4.5.2 Lines of Evidence

The list of documents required on this site are set out in Section 4.1.

All records should reference the source of the documentation, be dated and legible. It is preferable that records are supplied in electronic (PDF) format. Where appropriate drawings are provided, these should include a north arrow and should be drawn to scale with dimensions.

Material quantities retained, removed, and imported should be recorded in units of cubic metres (m³).

Photographs of the site layout, excavations, stockpiles, protection measures and other features of relevance to the remedial works should be taken with a digital camera and be accompanied with descriptions and a drawing identifying the vantage point.

Laboratory analytical data should show MCertS certification for soils and UKAS certification for water and asbestos and include laboratory test certificate and if necessary AQC data.

If applicable, the Contractor will need to supply documentary records where ground conditions, design changes or other factors have led to changes to the Remediation Strategy.

The Contractor is responsible for collating the necessary evidence to show that the remedial works have been carried out. These shall be supplied to the Client's Geo-environmental Consultant who will then prepare a Verification Report to demonstrate compliance with the remediation objectives.

Notwithstanding other requirements the following key records shall be provided:

- Location, extent, and depth of all excavations and contaminant 'hotspots', if encountered.
- Location, extent, and depth of all substructures encountered and grubbed out.
- Location(s) of all temporary stockpiles.
- Positions and depths of all verification sampling points.
- Delineation of fill by reused material and imported material.

4.6 Retaining Duty of Care Records

There is also the requirement to retain waste documentation (either electronically or on paper format) for the following periods of time:

- Two years for non-hazardous waste.
- Two years for season tickets; and
- Three years for hazardous waste consignment notes.

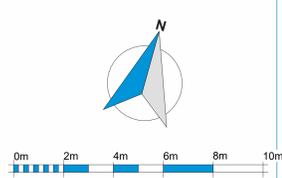
Attention is also drawn to the fact that HMRC as of the 1st of April 2018 have the power to recover Landfill Tax payments on a joint and several liability basis where it is deemed the tax has been avoided through illegal disposal. It is understood that from a tax perspective, records may need to be kept for longer.

4.7 Ongoing Monitoring

Excepting the monitoring activities identified in this report (e.g. Inspection and Discovery Strategy), there is currently no expectation to carry out other monitoring for geo-environmental purposes.

No requirement for long-term monitoring following completion of the works has been identified at this stage.

Appendix 1: Proposed Development Drawings



VISUAL SCALE 1:100 @ A0

Rev	Description	By	Chk	Date
P1	Updated for S2 Issue	HB	MYH	20/12/22
P2	IPC comments added: external platform lift, and load bring to MTR2	LS	MYH	08/02/23
P3	Parking Note Added	EB	MYH	03/03/23
P4	RIBA Stage 3 Submission	EB/LS	LS	31/03/23
CR1	As Constructed Record	PH / AR	AR / DT	16/04/25
CR2	As constructed record updates for clarification	AR	DT	17/07/25

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PROJECT TITLE: Dewsbury and District Hospital
 ADDRESS: Halifax Rd, Dewsbury, WF13 4ES

DRAWING TITLE: Proposed Site Plan

DRAWING REFERENCE: 180598_DGL_01_00_DR_A_1160

PROJECT ORGANISER	VOLUME	LEVEL	TYPE	ROLE	NUMBER
14/12/22	HB	LS	1503	m²	

INITIAL ISSUE DATE: 14/12/22
 INITIAL ISSUE BY: HB
 INITIAL CHECKED BY: LS
 SCALE: 1:503 m²
 SHEET: A0
 REV: CR2
 DATE CODE: 25/07/2025 09:44:15

- Existing yellow hatching to be inspected after landscaping works are done to determine if they need to be repainted
- Plinth wall, 600mm tall from external ground level with a rowlock top course, to form a step down
- Proposed step down to LV Room (150mm rise) with high contrast edging (1 step)
- Wall mounted crash rail, top of crash rail 600mm from the external ground
- Parking is designated for staff and deliveries only

Key:

[Yellow]	Proposed building
[Orange]	Existing building
[Grey]	Proposed New Path Tarmac - 181.2 m ²
[Light Grey]	Existing tarmac
[Dark Grey]	Reinstated tarmac - 655.3m ²
[Brown]	Loose pea gravel infill - 9.0m ²
[Cross-hatch]	Proposed new tarmac for new walkway - 110.8m ²
[Diagonal lines]	Proposed new tarmac for new ramp (southwest corner) - 61.4m ²
[Dotted]	600mm x 600mm buff concrete slabs to match the existing ramp slabs - 36.8m ²
[Blue]	Concrete foundation pad - 24.0m ²
[Green]	Proposed Soft Landscaping - 333.3 ² top-soil and seeded
[Light Green]	Existing Soft Landscaping
[Blue line]	Proposed pink kerb - 121.31/m
[Orange line]	Proposed road kerb - 39.11/m
[Green line]	Retaining wall
[Red line]	Crash Rail - Approx. 10.21/m
[Green circle]	Proposed trees - x1
[Light Green circle]	Existing Trees
[Green star]	Shrubs
[Green square]	Planting-Ornamental Mixes
[Black square]	Existing Levels
[Red square]	Proposed Levels

NOTE:
 DGL drawing to be read in conjunction with Landscape Architect drawing.
 Prior to execution, the sub-contractor is to assume design responsibility for all elements of their work and safety themselves with the details shown on the drawing. Design, compliance with relevant regulations and execution on site is the responsibility of the appointed sub-contractor

- 2 No. Bike shelters
- Existing shrub to be retained or re-planted. Planting to be maintained at a low level and cut back to ensure visibility splays as required.
- Existing Opening Door
- Existing ramp and wall up to the new aco drain remain untouched
- (Dashed Red) - Existing handrail
- (Dashed Green) - Proposed handrail to match (Blue region) Proposed aco drain
- Proposed buff brick wall aligned with existing
- Proposed cross hatch yellow box zone on road
- Tapered new slabs to match (less than 1:20)
- Flat landing of new slabs to match
- Existing Opening Door

1 No. Proposed tree - Prunus avium (See Drawing: "315972 - ADW02 - Fig 3 - Soft Landscape Proposals")

Concrete slab edge reinstated and all ground tapered to the proposed path

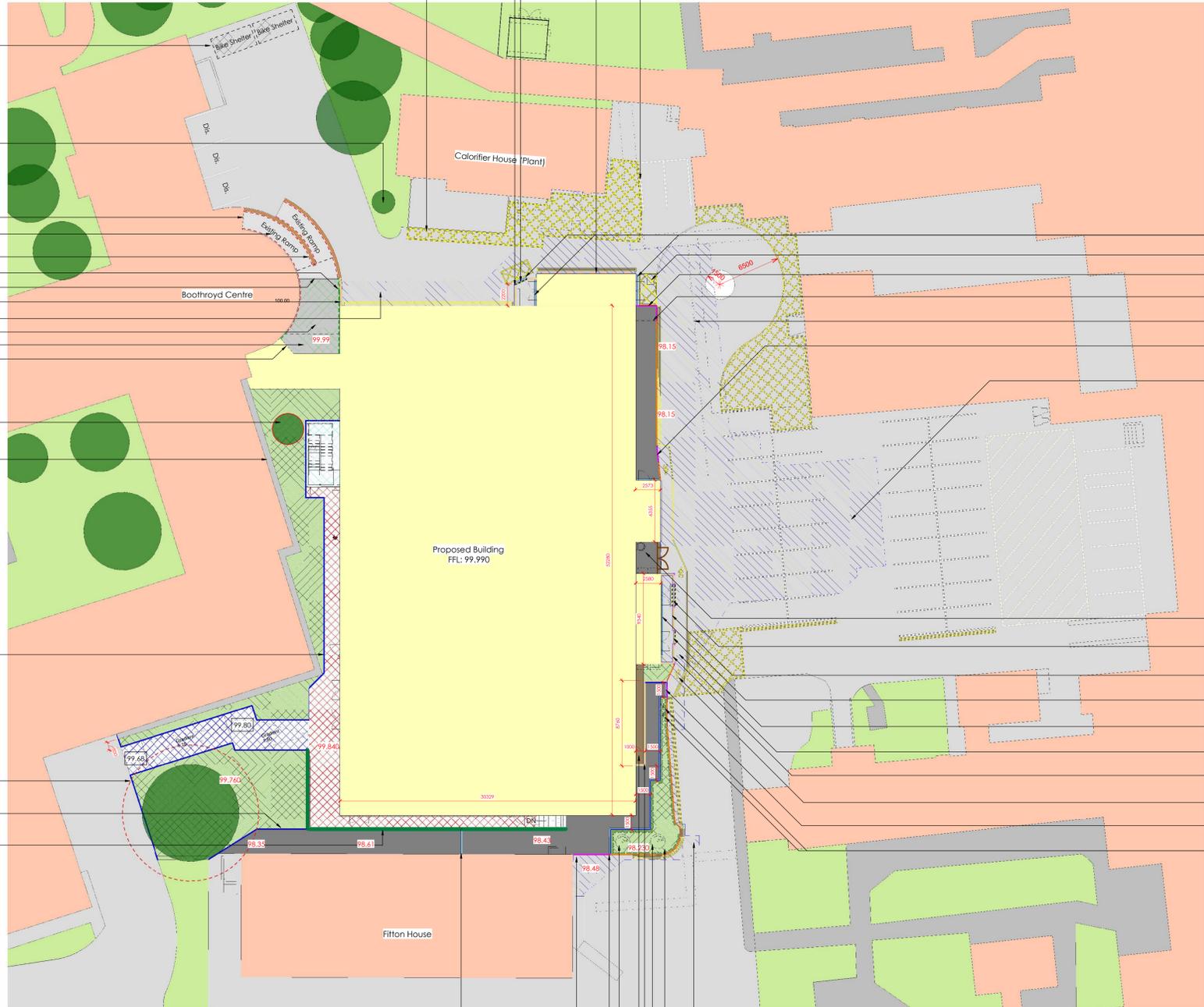


Low level (circa 600mm height) Hooped perimeter barriers aligned along the path edge to act as a barrier for the disposal bins or disposal trolleys

Red Dashed Line - Root protection zone for the tree. Minimal digging or ground scaping within this area to prevent any damage to the roots

Existing wall to be reinstated and made good - no additional shrubbery or rails proposed

Retaining wall



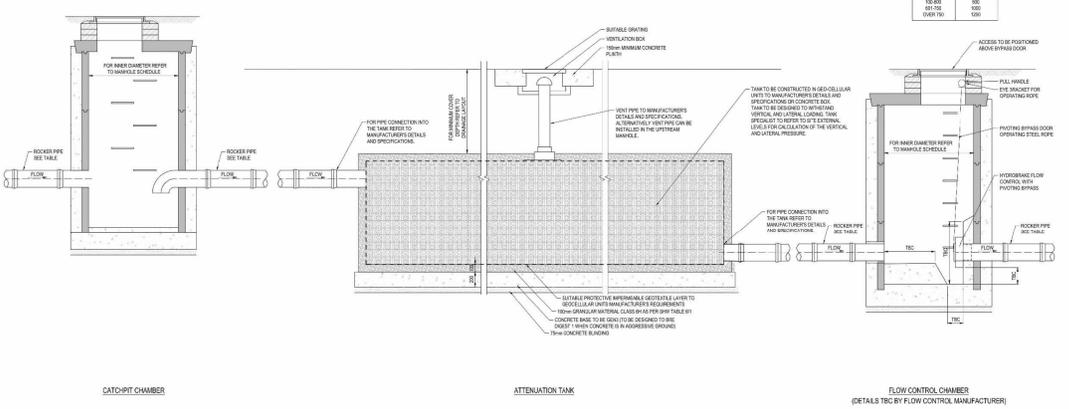
- Proposed aco drains (blue region)
- Manhole - will be on a flat shared surface area
- Dropped Kerb
- Chamfer down from kerb height (1:12 gradient)
- Indicative aco drain run set circa 5000mm from the new kerb edge - to align with existing and proposed manholes that have already been set
- Dropped Kerb
- Proposed ventilation box with a 150mm minimum concrete plinth and suitable grating over within this area to accommodate the vent pipe from the attenuation tank (Please see drawing: 10060-D4S-XX-XX-DR-C-4002)

- CAT ladder and hard landscaping and fencing with 2m wide gate between the IPS/UPS room and lift building
- Proposed step down to LV Room (150mm rise) with high contrast edging (2 steps) + 1 No. fold down bollard centered on step
- Plinth wall, 600mm tall from external ground level with a rowlock top course, to form a step down
- Proposed aco drain along the front edge of the IPS/UPS room
- Proposed step down to LV Room (150mm rise) with high contrast edging (1 step) - (no bollard)
- Existing manhole
- (Pink lines) 6 No. rubber corner guards on the plinth wall edges with high visibility black and yellow chevrons
- Line painted pedestrian zone on shared surface (optional) - TBC
- Dropped Kerb
- 2No. Proposed Shrub - Phormium tenax 'Variegata' (See Drawing: "315972 - ADW02 - Fig 3 - Soft Landscape Proposals")

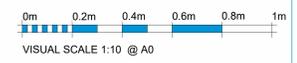
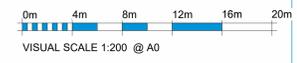
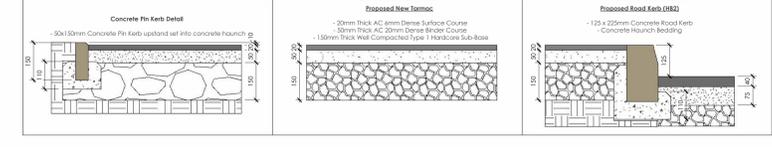
Proposed Landscaping Plan 01
1 : 200

- Road width widened to avoid an existing aco drain and an edging curve of the end to avoid a new manhole
- 28m² Groundcover Mx - 84No. plants @ 3/m² (See Drawing: "315972 - ADW02 - Fig 3 - Soft Landscape Proposals")
- 1No. Proposed Shrub - Photinia x fraseri 'Red Robin' (See Drawing: "315972 - ADW02 - Fig 3 - Soft Landscape Proposals")
- Proposed plinth wall kept as low as possible to encase the protruding foundation pads with a 50mm perforated drainage pipe buried against the wall with a pea gravel infill draining to a local down pipe
- Raised area infilled with decorative gravel.
- 1No. Proposed Shrub - Amelanchier lamarkii (See Drawing: "315972 - ADW02 - Fig 3 - Soft Landscape Proposals")
- Proposed aco drain (already on drainage drawing) - (blue region)
- Dropped kerb
- Proposed aco drain (blue region)

(not to scale)
 Extract from drawing: 10060-D4S-XX-XX-DR-C-4002



Landscape Detail
1 : 10



Rev	Description	By	Chk	Date
P3	North aco drain edit. Entrance handrail amended, 6 corner barrier added and some crash rails removed. rear ramp edited to as-built, low-level loop barriers added to west elevation	AR	DT	14/03/25
CR1	As Constructed Record	AR	DT	11/04/25
CR2	Key and materials updated for accuracy	AR	DT	07/07/25

DarwinGroup
 Construction has Evolved

PROJECT TITLE: Dewsbury and District Hospital
 ADDRESS: Halifax Rd, Dewsbury WF13 4BS

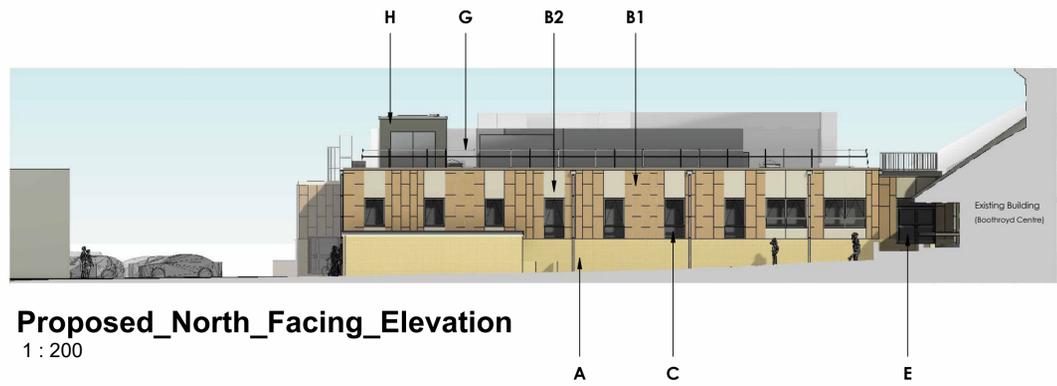
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DRAWING REFERENCE: 180598 DGL 01 XX DR A 1402

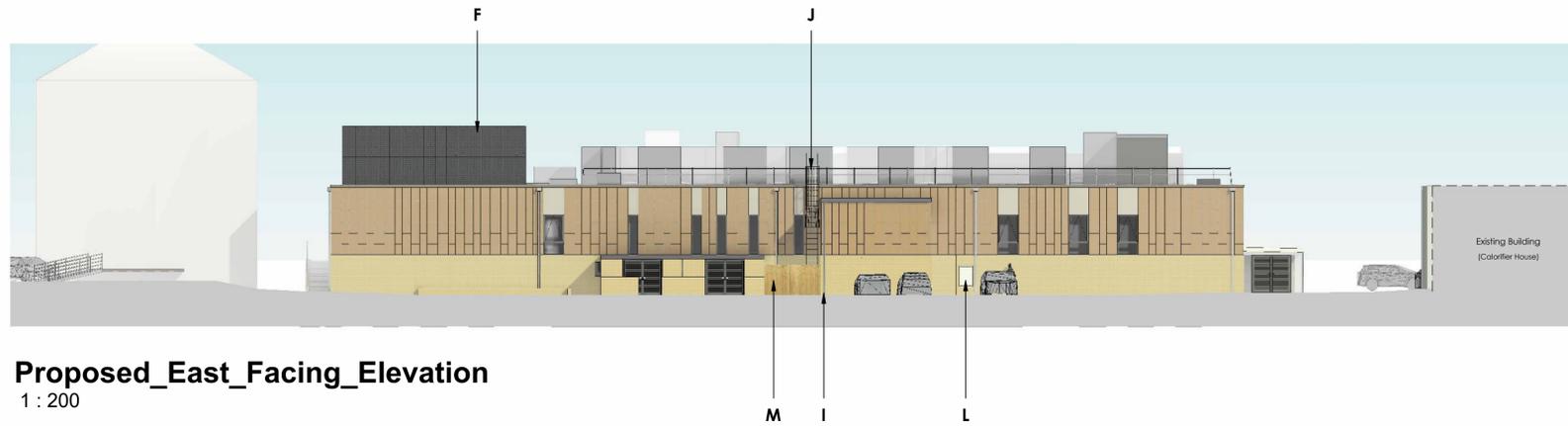
PROJECT ORIGINATOR: DGL
 PROJECT VOLUME: 01
 DATE: 14/10/24
 INITIAL ISSUE DATE: 14/10/24
 INITIAL ISSUE BY: AR
 INITIAL CHECKED BY: CR
 SCALE: 1:503 m²

SUITABILITY: As Constructed
 SCALE: As Indicated
 SHEET: A0
 REV: 2

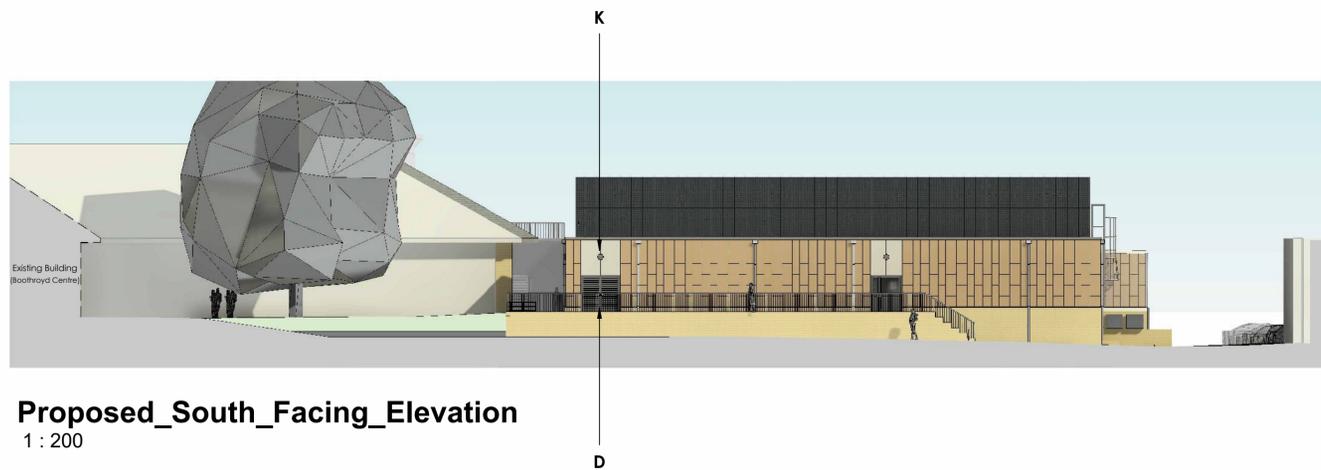
DATE: 29/07/2025 09:44:53



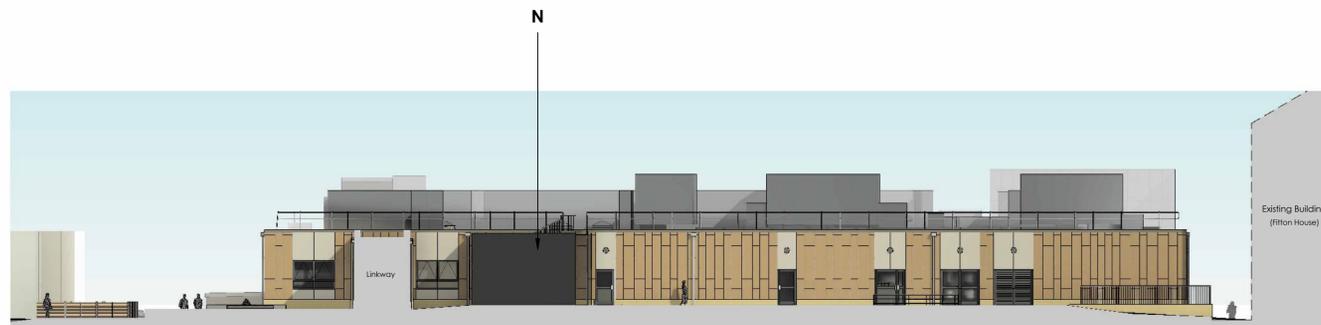
Proposed_North_Facing_Elevation
1 : 200



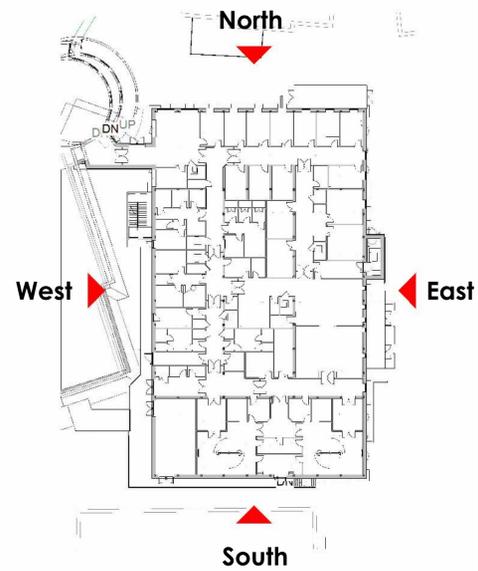
Proposed_East_Facing_Elevation
1 : 200



Proposed_South_Facing_Elevation
1 : 200



Proposed_West_Facing_Elevation
1 : 200



Elevation Plan
1 : 500

Cladding	
A	Brickwork Plinth - Buff Brick Village Golden Thatch  Product photo
B1	Architectural Cladding - Equitone TE 30 (Sandstorm)   Colour match from product photo Product photo
B2	Architectural Cladding - Equitone TE 00 (Calico)   Colour match from product photo Product photo
External Windows/Doors	
C	Aluminium Windows - Anthracite Grey RAL 7016
D	PPC Aluminium Frame External Louvred Door - Anthracite Grey RAL 7016
E	PPC Aluminium Frame External Glazed Door - Anthracite Grey RAL 7016
External Components	
F	Ballasted Louvre Screen RAL 7016
G	Ballasted Handrail
H	GRP Enclosure - Grey
I	82mm uPVC Round Downpipes, Black
J	CAT Ladder
K	External Bulkhead Light
L	White Access Panel
M	Vertical Closeboard Fencing
N	Sheet metal cladding - RAL 7016

Rev	Description	By	Chk	Date
P1	Updated for S2 Issue	HB	MYH NHST	20/12/22
P2	IPC comments added: external platform lift, and lead lining to MTR2	LS	MYH NHST	08/02/23
P3	External Stair Added	EB	LS	13/02/23
P4	RIBA Stage 3 Submission	EB/ CA	LS	31/03/23
P5	Updated materials	ET	CR	14/08/23
CR1	As Constructed Record	FH / AR	AR / DT	16/04/25
CR2	As constructed record updates for clarification	AR	DT	17/07/25

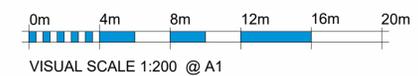
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PROJECT TITLE: Dewsbury and District Hospital
ADDRESS: Halifax Rd, Dewsbury, WF13 4HS

DRAWING TITLE: Elevations

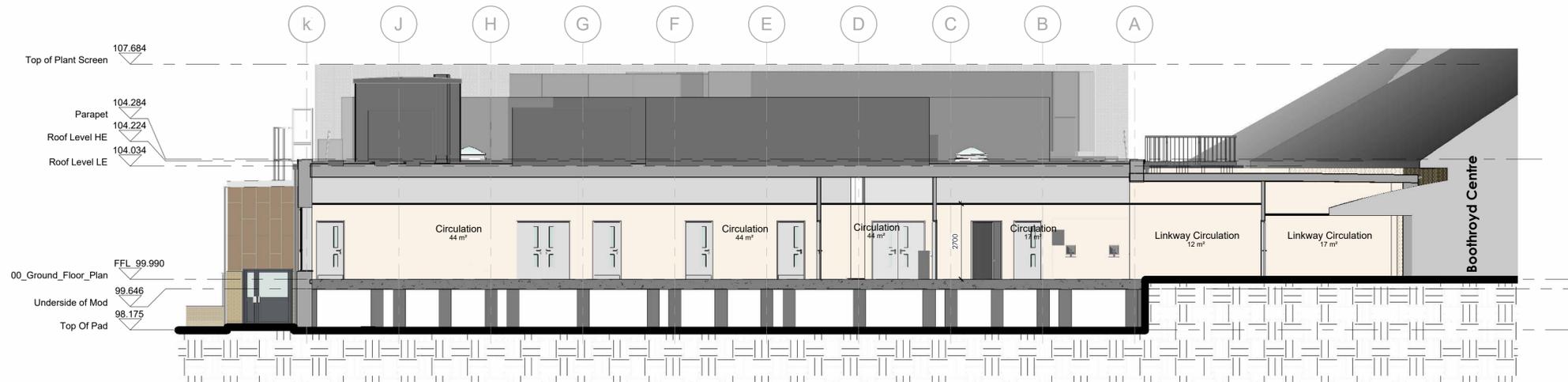
DRAWING REFERENCE					
PROJECT	ORIGINATOR	VOLUME	LEVEL	DR	A
180598	DGL	01	XX	DR	A
INITIAL ISSUE DATE			INITIAL ISSUE BY	INITIAL CHECKED BY	GIFA
14/12/22			HB	LS	1503 m ²
SUITABILITY			SCALE	SHEET	REV
CR As Constructed Record			As indicated	A1	CR2
STATUS CODE		STATUS DESCRIPTION			



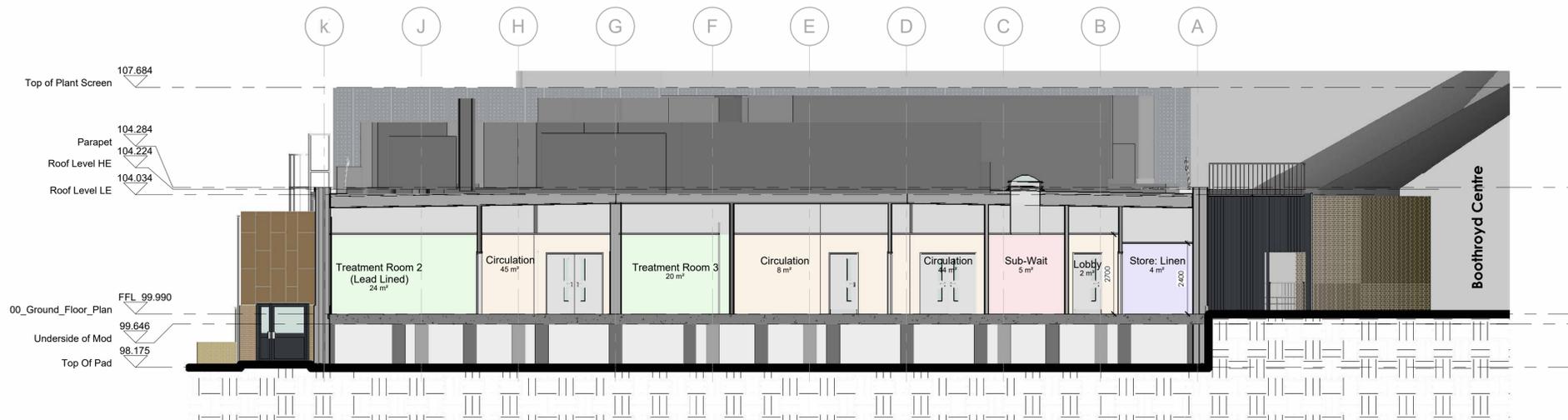
Dewsbury and District Hospital



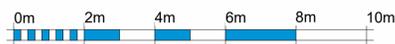
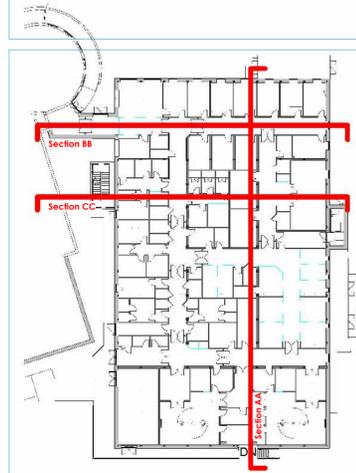
Proposed Section AA
1 : 100



Proposed Section BB
1 : 100



Proposed Section CC
1 : 100



VISUAL SCALE 1:100 @ A1

Rev	Description	By	Chk	Date
P1	RIBA Stage 3 Submission	EB/CA	LS	31/03/23
CR1	As Constructed Record	FH/AR	AR/DT	16/04/25
CR2	As constructed record updates for clarification	AR	DT	17/07/25

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PROJECT TITLE: Dewsbury and District Hospital
ADDRESS: Halifax Rd, Dewsbury WF13 4HS

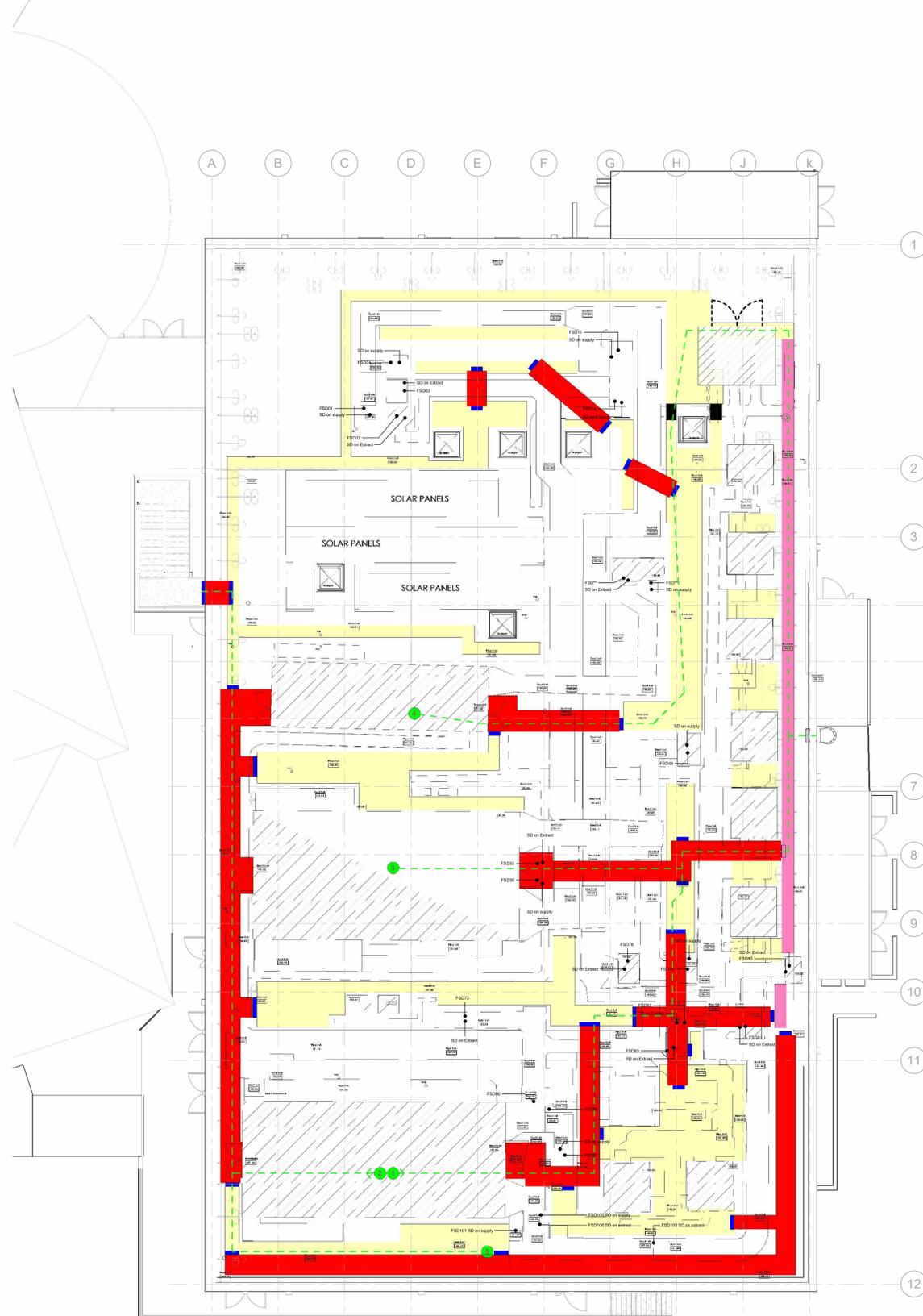
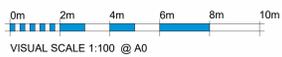
DRAWING TITLE: Proposed Building Sections

DRAWING REFERENCE						
PROJECT	ORIGINATOR	VOLUME	XX	DR	A	2300
180598	DGL	01	XX	DR	A	2300
INITIAL ISSUE DATE			INITIAL ISSUE BY		INITIAL CHECKED BY	
12/12/2022			CH		LS	
SUITABILITY			SCALE		SHEET	
CR As Constructed Record			As indicated		A1	
STATUS CODE			STATUS DESCRIPTION		REV	
					CR2	

23/07/2025 09:48:18



00_Ground_Floor_Plan
1 : 100



Roof Plan
1 : 100

Module Schedule		
W X L X H(m)	Level	Quantity
2.8 x 9.9 x 4.6	GF	6
3.4 x 9.9 x 4.6	GF	21
3.3 x 11.1 x 4.6	GF	18
Total		45

Legend
 Ground Floor GFA: 1503m²
 Linkway GFA: 17m²

- GA developed in consultation with client team during meetings 19th Oct '22 - 2nd Nov '22, updated following IPC comments.
- Derogations from initial SoA are noted in the Derogation Schedule (180598-DGL-01-SH-A)

Roof Plan Key

Anti-slip painted walkway - To be done by Darwin roofing production team - approx 250m ²	
Step over	
Access to the step over either slippladder or up and over steps	
Cross grip matt or duckboard safety walkway - approx 330m	
Duct access positions	
Volume control damper positions	

Please Note:
 Survey heights and dimensions are indicative only. Several valves and other mechanical elements may extend above the recorded TOPO points. It is the recipient's responsibility to conduct their own survey and due diligence to verify all critical levels and obstructions before proceeding with design and installation.

Fire exit route	Length
1	42.8m
2	38.1m
3	25.9m
4	60m
5	46.9m

Department Key:

	Admission Suite Facilities
	Circulation
	Operating Theatre Suite
	Outpatients
	Plant & Services
	Public Facilities
	Recovery Unit
	Staff Facilities
	Storage - Overall for Building
	Toilet Facilities

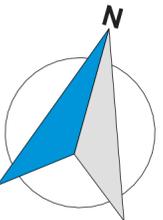
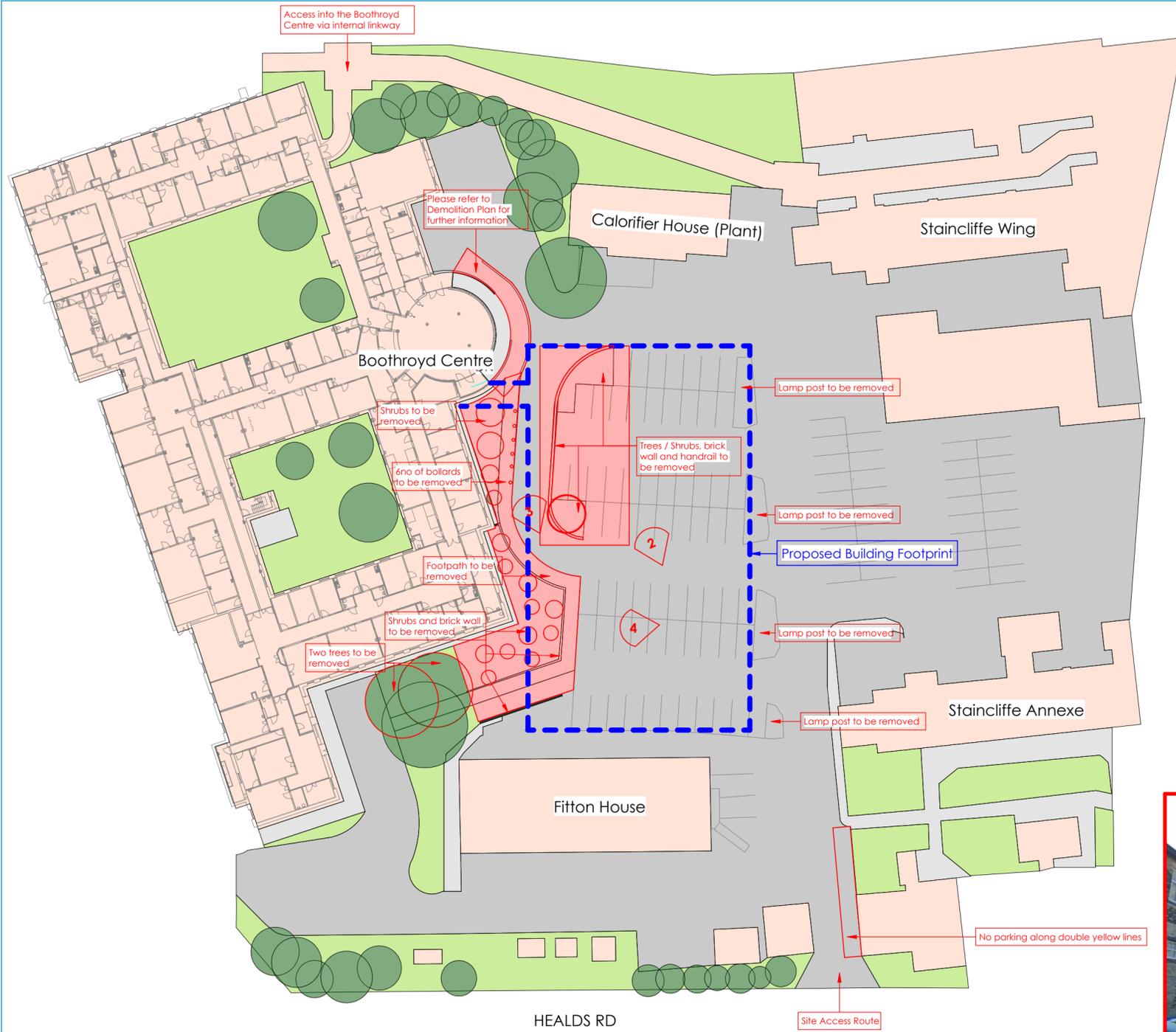
Rev	Description	By	Chk	Date
P17	Changed name to store	RW	DT	13/03/25
CR1	As Constructed Record	AR	AR / DT	16/04/25
CR2	As constructed record updates for clarification	AR	DT	17/07/25



PROJECT TITLE Dewsbury and District Hospital	ADDRESS Hoffon Rd, Dewsbury WT3 4RS
DRAWING TITLE General Arrangements	
DRAWING REFERENCE 180598_DGL_01_ZZ_DR_A_2000	
PROJECT ORIGINATOR 25/05/22	DATE LS
INITIAL ISSUE DATE 25/05/22	INITIAL ISSUE BY LS
SUITABILITY CR	SCALE As Indicated
AS CONSTRUCTED	SHEET A0
RECORD	REV CR2

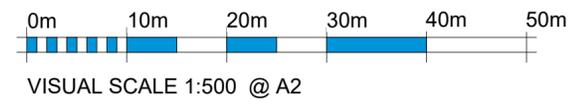
23/07/2025 09:45:35

Appendix 2: Proposed Site Enabling Plan



Key

	Proposed Building Outline
	Existing Building
	Existing Trees
	Existing Trees to be removed
	To Be Removed
	Viewpoint of Images



Enabling Works Plan

1 : 500

Rev	Description	By	Chk	Date
P1	RIBA Stage 3 Submission	EB/CA	LS	31/03/23

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PROJECT TITLE	Dewsbury and District Hospital	ADDRESS	Halifax Rd, Dewsbury WF13 4HS
---------------	--------------------------------	---------	-------------------------------

DRAWING TITLE	Enabling Works
---------------	----------------

DRAWING REFERENCE	180598	DGL	01	XX	DR	A	1175
PROJECT	ORIGINATOR	VOLUME	LEVEL	TYPE	ROLE	NUMBER	

INITIAL ISSUE DATE	INITIAL ISSUE BY	INITIAL CHECKED BY	GIFA
23/02/23	EB	LS	1503 m ²

SUITABILITY	SCALE	SHEET	REV
S2 For Information	As indicated	A2	P1
STATUS CODE	STATUS DESCRIPTION		

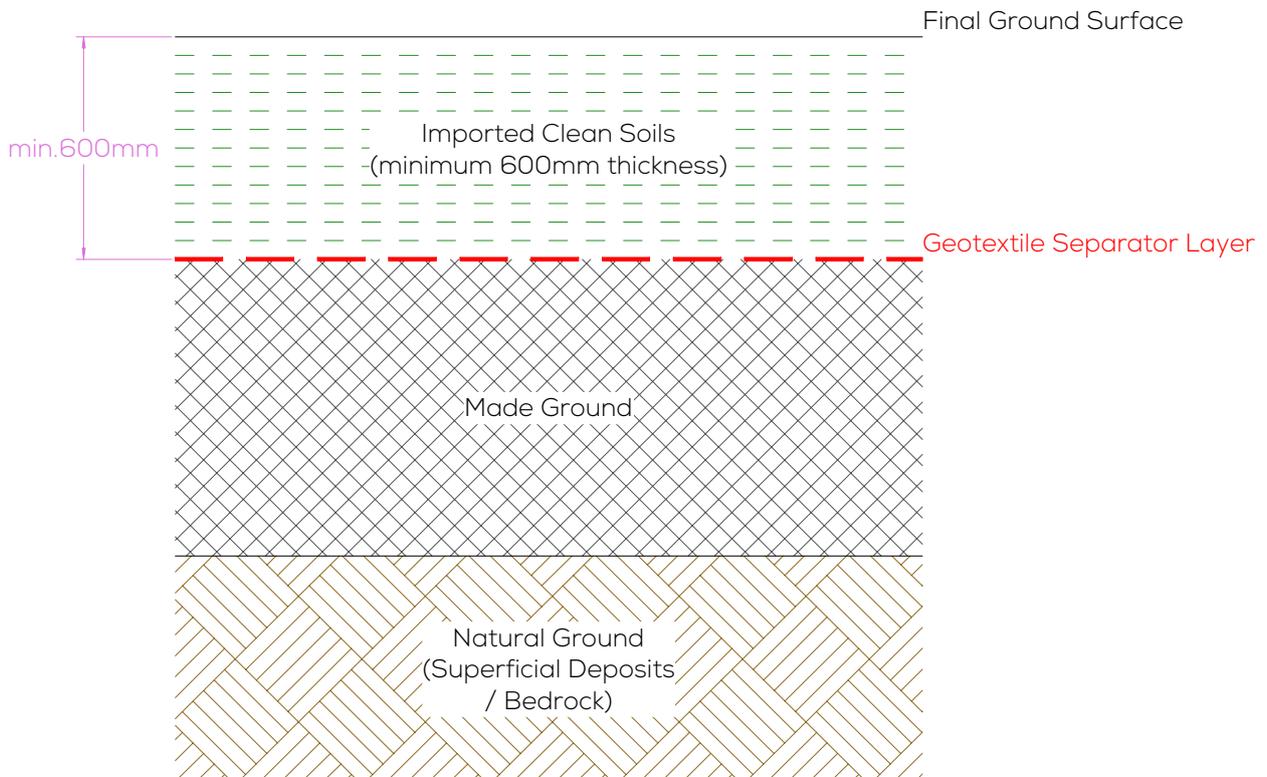


Appendix 3: Example Verification Strategy

Description	Sampling Type and Frequency	Testing Regime	Verification Procedure
Suspicious Ground Conditions – Verification Strategy			
<p>Potential 'hotspot' removed from surrounding 'clean' soil</p>	<ul style="list-style-type: none"> Addressed as a critical step of the Inspection and Discovery Strategy (see Section 3.4.2). Scope of sampling should be agreed with the Client's Geo-environmental Consultant before sampling is carried out. <p>To assess suitability for reuse and/or disposal for each hotspot the sampling regime may typically comprise:</p> <ul style="list-style-type: none"> (i) 3no. composite samples of 2no. subsamples for the first 50m³, then (ii) 1no. composite sample of 2no. subsamples for every 50m³ thereafter 	<ul style="list-style-type: none"> Addressed as a critical step of the Inspection and Discovery Strategy (see Section 3.4.2). Scope of the analysis should be agreed with the Client's Geo-environmental Consultant before testing is commissioned. <p>Each sample to be analysed as a minimum for Suite 1 plus Suite 2 as follows:</p> <p><u>Suite 1 - Soil</u></p> <ul style="list-style-type: none"> Arsenic, Boron (w/s), Cadmium, Chromium, Copper, Lead, Mercury (elemental), Nickel, Selenium, Sulphate (w/s as SO₄), Zinc, pH TPH Aliphatic EC5-EC6, >EC6-EC8, >EC8-EC10, >EC10-EC12 	<ul style="list-style-type: none"> Addressed as a critical step of the Inspection and Discovery Strategy (see Section 3.4.2). Photographic evidence of excavated material and void Copy of analytical data sent to Client's Geo-environmental Consultant. No free phase contamination present All verification documents comply with requirements specified in Section 4.
<p>Void created within 'clean' soil</p>	<ul style="list-style-type: none"> Addressed as a critical step of the Inspection and Discovery Strategy (see Section 3.4.2). <p>To verify that impacted soils have been delineated from the surrounding 'clean' soil the sampling regime may comprise:</p> <ul style="list-style-type: none"> 1no. within 1m above impacted horizon 1no. at impacted horizon 1no. within 1m below impacted horizon <p>Sample on a grid basis over lateral extent:</p> <ul style="list-style-type: none"> 1no. composite sample of 4no. sub-samples per 25m² of base, or part thereof 	<ul style="list-style-type: none"> TPH Aromatic >EC7-EC8, >EC8-EC10, >EC10-EC12 Total TPH C10-C40 PAH (EPA16 + benzo(j)fluoranthene) Benzene, Toluene, Ethylbenzene, Xylenes Asbestos screen <p><u>Suite 2 – Waste Acceptance Criteria</u></p> <ul style="list-style-type: none"> For all categories of landfill Leachate preparation at 10:1 liquid/solid ratio in accordance with BS EN 12457 	

Appendix 4: Simple Cover System Details (9202-007-001)

Simple Cover System Detail.
Imported clean capping layer in areas of soft landscaping
over existing Made Ground.



GENERAL NOTES:

1. Refer to KGS Groundworks Discovery & Remediation Strategy report reference 9202-007-R-01 for full details.
2. The imported soils shall comply with the recommendations in Section 3.7 if the above report.

P01	FIRST ISSUE	RN	DH	10/07/24
REV.	AMENDMENTS	DRW	CHK.	DATE

CLIENT

PROJECT
DEWSBURY & DISTRICT HOSPITAL

TITLE
SIMPLE COVER SYSTEM DETAILS

DRAWN: RN	DESIGN: WR
CHECKED: DH	APPROVED: WR
DATE: JUL '24	SCALE: NOT TO SCALE

STATUS PRELIMINARY	SHEET SIZE A4
DRAWING NO. 9202-007-001	REV. P01

Appendix 5: Gas Protection Verification Plan (Geoshield)

The logo for the British Geomembrane Association (BGA) features the letters 'BGA' in a bold, white font inside a dark green rounded rectangle. Below the letters, the full name 'British Geomembrane Association' is written in a smaller, white font.

GeoShield Verification Plan



PROJECT DESCRIPTION

GEO104074
Darwin Group,
Dewsbury Hospital,
Dewsbury,
WF14 4HS

The proposed development for which gas protection measures are required involves the construction of a new hospital building.

In accordance with BS8485:2015 + A1 2019, the Type B building must conform to a Characteristic Specification (CS) rating of 2, so mitigation will need to be 3.5 points. Due to elevated Radon potential and the maximum Radon potential is 5-10% therefore Basic Radon protection measures are required.

Geoshield have adopted the highest design and verification principles associated with BS8485:2015 + A1 2019, BR 211, Public Health England, NHBC Technical Extra April 2016 and CIRIA 735.

This pre-verification plan reviews the design to ensure it is compliant with the developer and planning authority requirements and in conjunction with the relevant investigation report in accordance with BS8485:2015 + A1 2019.

In summary, the design does achieve a required level of attention to detail with its robust specific gas membrane design (2.0 points), the structural barrier of concrete pad foundation with a large passive subfloor void connected to air bricks for ventilation provisions (1.5 points).

The pre-verification plan confirms how the installation will be tested in accordance with CIRIA735. The verification visits will be documented in verification reports during the project that are suitable for submission to the local planning authority in order to satisfy and discharge planning consent.

All faults identified during inspection and the verification site visit of the ground gas system will be itemised as remediations which will need to be signed off in the remediation log for the proposed building.



GeoShield Verification Plan



PROJECT DESCRIPTION

Pre-Verification Plan

GeoShield are appointed by the Client to carry out independent validation, verification and integrity testing of the ground gas protection system on site. The Pre-Verification plan sets out the requirements and procedures that GeoShield will adopt to ensure that the installation is in line with the proposed design, relevant UK standards and guidance. GeoShield take no responsibility for any warranties to third parties for the design of the system or the installation.

Limitations

The Pre-Verification plan prepared by GeoShield Limited is limited to the proposed ground gas protection measures installed. The Pre-Verification plan has been prepared in line with the relevant UK Standards and Guidance (BS8485:2015+A1:2019 & CIRIA 735) alongside the information made available to GeoShield by the Client. The conclusions made in the report are considered to be correct at the time of writing, but additional information provided/discovered may require amendments to the Plan. GeoShield recognises that changes to relevant standard and guidance may occur at any time which may cause the conclusions made to be incorrect - GeoShield do not accept any responsibility or liability for the implications of such changes.

The Pre-Verification plan does not in itself constitute verification that the membrane has been installed in accordance with this document. Validation and verification of the installed membrane will be covered in separate verification reports following physical inspection of the gas barrier and will include photographic evidence of the installation.

Waterproofing elements (where applicable) do not fall into the remit of this Pre-Verification plan or future inspections. GeoShield will provide the opinion on membrane's suitability for ground gas protection purposes – no liability is offered or implied for the waterproofing element which should be checked by others.



GeoShield Verification Plan



CONTENTS

Section 1	Project Description
Section 2	Project Material Specification
Section 3	Project Information
Section 4	GeoShield Surveyor Information
Section 5	Project Information: Drawings, SI, MSDS, Radon Maps
Section 6	Client Details
Section 7	Application Team Leaders
Section 8	Health and Safety
Section 9	Applicator Competence
Section 10	Gas Regime
Section 11	Testing
Section 12	Risk Assessment
Section 13	GeoShield Competence
Section 14	Method Statement
Section 15	Project Technical Assessments
Section 16	Pre-Contract Meeting Checklist
Section 17	Pre-Contract Meeting Summary



GeoShield Verification Plan



PROJECT REFERENCE: GEO104074

PROJECT: Dewsbury Hospital

PROJECT ADDRESS:

Dewsbury

WF14 4HS

SPECIFICATION: Verified in accordance CIRIA 735.

Design in accordance with BS8485 2015 + 2019 for Methane and Carbon Dioxide.

Substrate prepared in accordance with manufacturers instructions.

Proctor GM Super Gas Barrier

Proctor GM Flashing Strip



GeoShield Verification Plan



NAME OF SURVEYOR:

Paul Colbeck

VERIFICATION COMPANY:

GeoShield Limited

Icon Business Centre

4100 Park Approach

Thorpe Park

Leeds, LS15 8GB

CONTACT NUMBER:

EMAIL ADDRESS:

ORDER NUMBER:

To be confirmed

PER VISIT:

YES:

NO:

PROJECT:

YES:

NO:



GeoShield Verification Plan



INFORMATION INCLUDED

9202-002-R-01-0

17960-S01revA

17960-S02

180598-DGL-XX-XX-DR-A-3200-(P1)-Ground Floor Interface Revised Heights

Geoshield Ground Gas Design Details

Material Specification Technical Data Sheets

Information presented to at the pre-verification stage assumed correct

Any change client will let GeoShield know or this Pre-verification Plan will be void.



GeoShield Verification Plan



SPECIFICATION



Dewsbury & District Hospital
Gas Monitoring Summary Report
(August 2023)

Prepared for Darwin Group Ltd

Title Reference & Description:

9202-002-R-01-0



SPECIFICATION

Darwin Group Ltd

Dewsbury & District Hospital

Figure 2.1-2: Site Boundary



2.2 Findings of the Ground Investigation

A ground investigation for the proposed development was undertaken by KGS in April 2023 (report reference 9202-001-R-01-1 "Phase 1 Desk Study & Phase 2 Report on Ground Investigation"), identified that there was a low risk of ground gas associated with deeper areas of Made Ground at the Site, but also that there was a risk of ground gas associated with the coal seams and potential deeper mine workings of the area, especially as the Site is adjacent to a larger fault system which could act as a pathway for mine gas from any deeper seams/workings. This has the potential to affect the end users, maintenance workers, construction workers and the building's structure.

During the ground investigation six gas monitoring wells were installed within each of the window sample holes. It was recommended that further investigation of the ground gas regime by monitoring of the gas standpipes be undertaken.

The UK Radon Map (<https://www.ukradon.org/information/ukmaps>) states that some addresses at this location are in bands of elevated radon potential and the maximum radon potential is 5-10%. Radon has the potential to collect in confined spaces and become a long-term health risk for site users and maintenance workers. The UK Radon Government website recommends that for sites in the 5-10% risk band that basic radon protective measures are implemented.

3 Gas Monitoring

3.1 Proposed Gas Monitoring Program

At the time of the report, it was assumed that the building was to contain in-patient wards, where patients would be resident for long periods of time; based on CIRIA C665, 2007, such a building was taken to be

Title Reference & Description:

9202-002-R-01-0

Basic Radon protection measures are required.

SPECIFICATION

3.2 Results Summary

Six sets of gas monitoring were undertaken at all six monitoring points on Site between 26th April 2023 and 23rd August 2023, and at a range of atmospheric pressures, including two sets at less than 1000mbar, the results of which are included in Appendix 1.

Each gas monitoring reading recorded the peak and steady-state percentages of methane, carbon dioxide and oxygen, the parts per million of hydrogen sulphide and carbon monoxide, as well as the balance of gas in air, borehole pressure, flow rate, and atmospheric pressure.

The levels of gases recorded are summarised in Table 3.2-1 below:

Table 3.2-1: Summary of Recorded Gas Levels

Values	Methane GIA% Peak (Steady)	Carbon Dioxide GIA% Peak (Steady)	Oxygen GIA% Peak (Steady)	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Balance of gas GIA%	Borehole Pressure Pa	Flow Rate L/h	Atmospheric Pressure mbar
Max	0 (0)	9.3 (9.0)	20.9 (20.9)	0	0	81.5	7	0.6	1010
Min	0 (0)	0 (0)	12.9 (12.9)	0	0	75.7	-1	-0.1	990

GIA – Gas In Air Volume

The results showed that levels exceeding the nationally agreed trigger values for carbon dioxide were recorded a even times over the duration of the monitoring period; these occurred at monitoring points WS03, WS05 and WS06, with the highest values (9.3% peak, 9.0% steady state) recorded in WS05.

9202-002-R-01-0

5

Rev 0

Darwin Group Ltd

Dewsbury & District Hospital

3.3 Interpretation of Results

An interpretation of the results has been carried out following the guidance in BS 8485:2015+A1:2019 (Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for New Buildings).

3.3.1 Initial Review

Based on the recorded concentrations of ground gas alone, the concentrations of carbon dioxide (>5%) would class the Site as CS2 (low hazard potential)¹.

Methane was not detected during the monitoring.

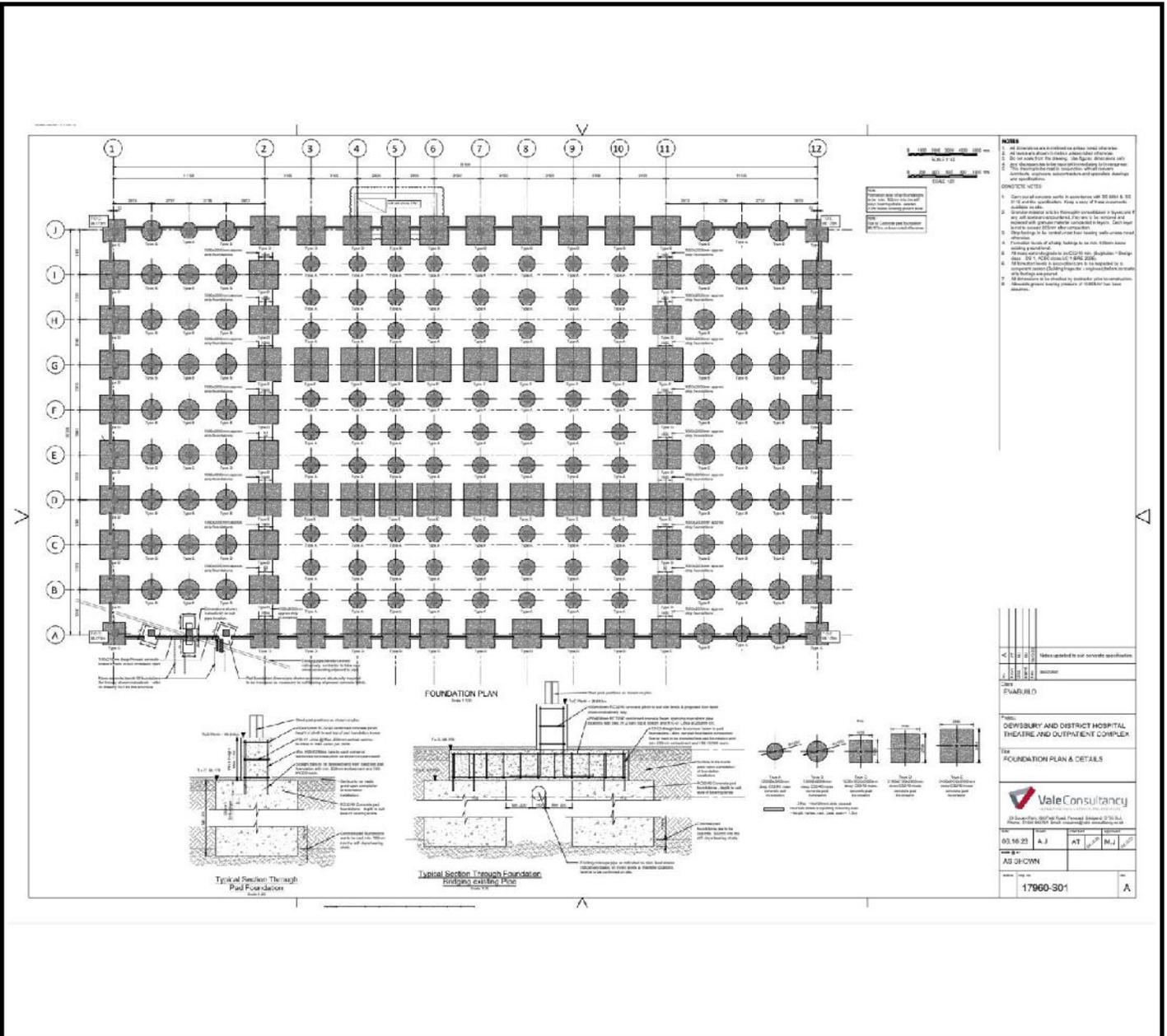
Title Reference & Description:

9202-002-R-01-0

The site has been classified as a CS2 gas regime rating due to elevated levels of Carbon Dioxide.

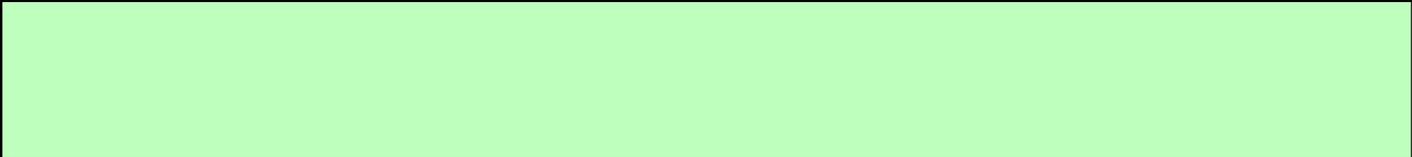
GeoShield Verification Plan

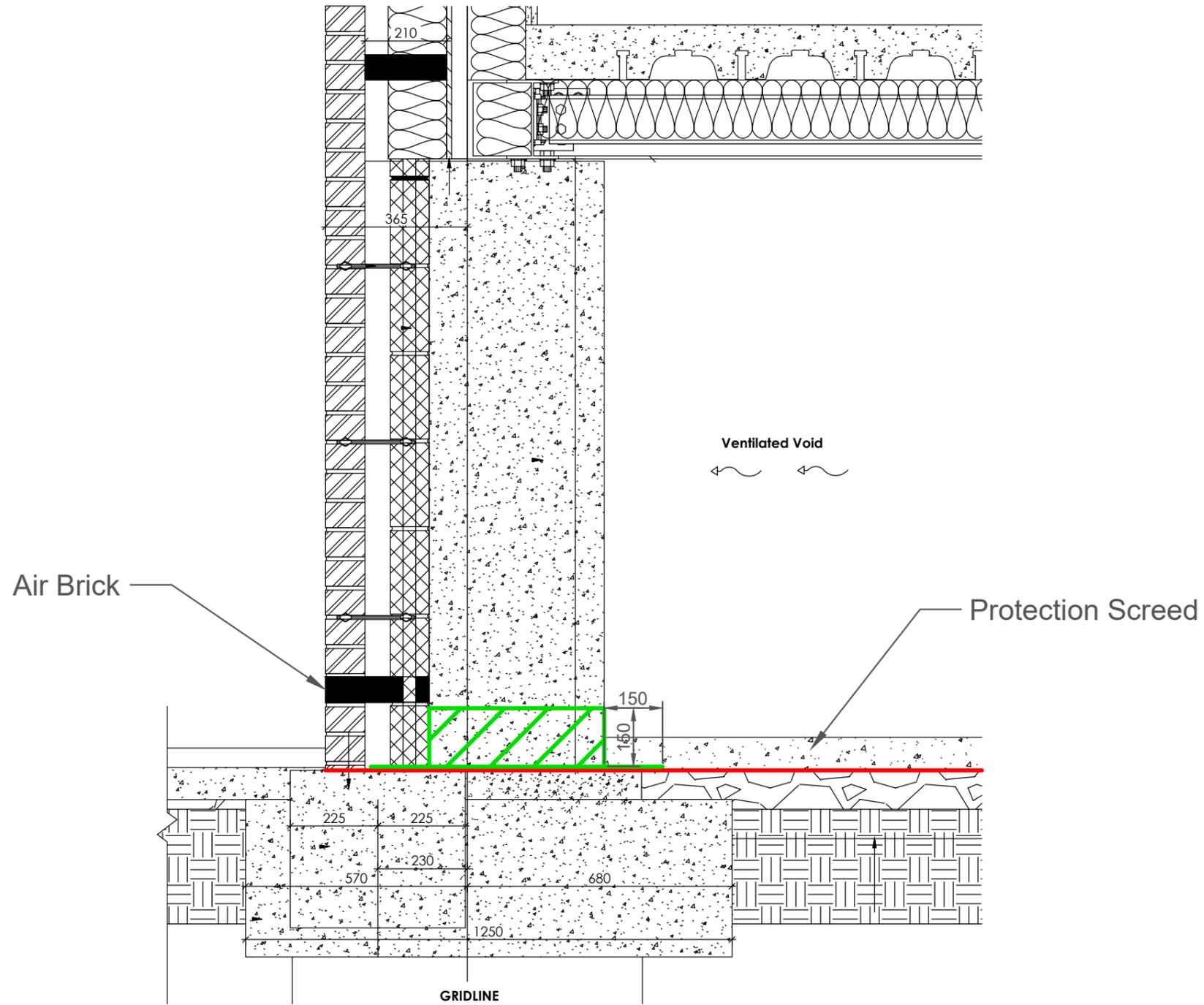
SPECIFICATION



Title Reference & Description:

17960-S01revA





CLIENT
Darwin Group

PROJECT
Dewsbury



- NOTES
- Proctor GM Super installed as per manufacturers guidance
 - All corners and penetrations to be sealed with Proctor GM Flashing

- Key
- Proctor GM Super
 - Proctor GM Flashing

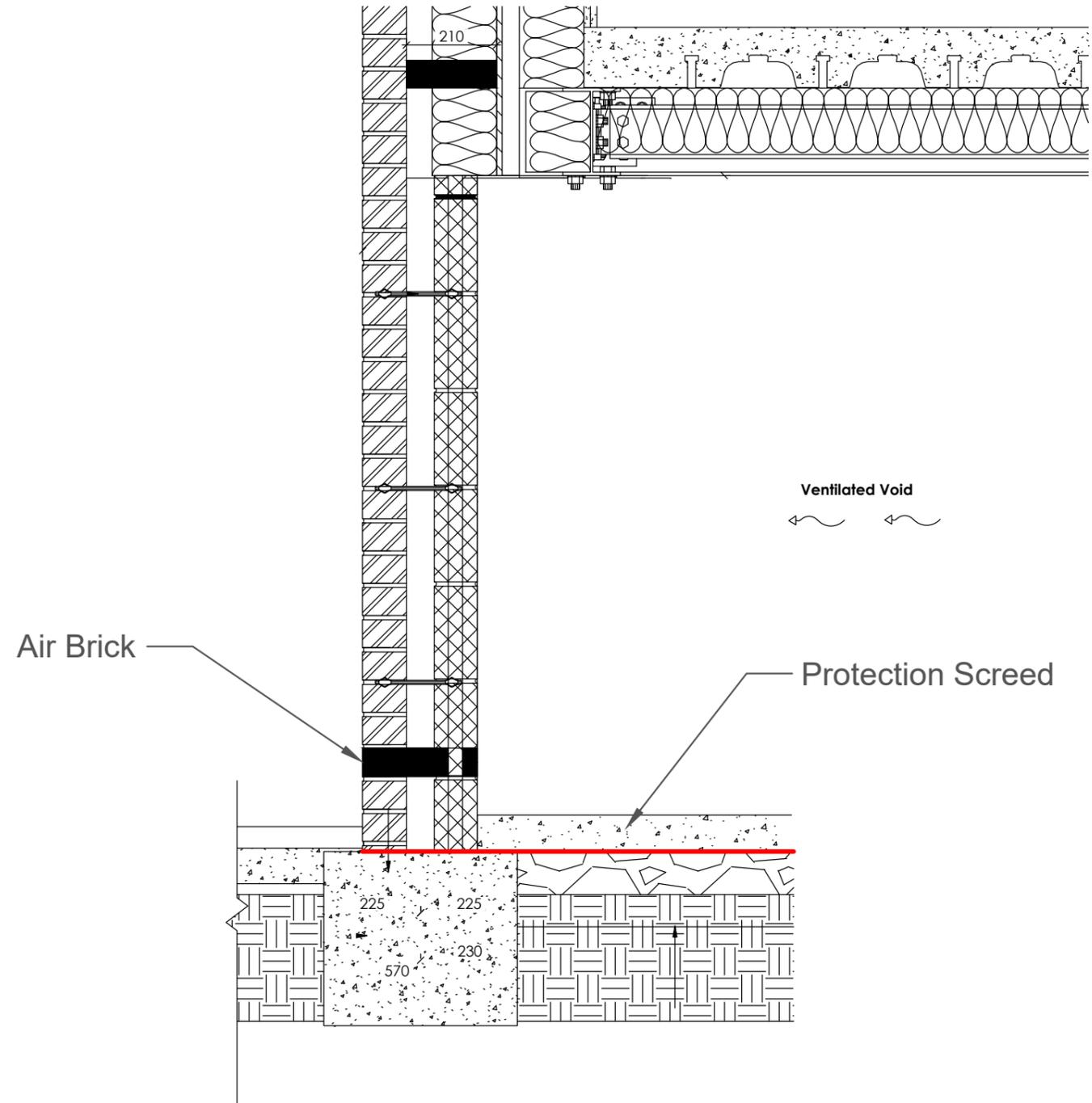
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Typical Perimeter Detail At Plinths

DRAWING NUMBER
GEO104074.01a

DRAWN BY OC	CHECKED BY PC	SCALE NOT TO SCALE	DATE 23/10/23
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CLIENT
Darwin Group

PROJECT
Dewsbury



NOTES

- Proctor GM Super installed as per manufacturers guidance
- All corners and penetrations to be sealed with Proctor GM Flashing

- Key

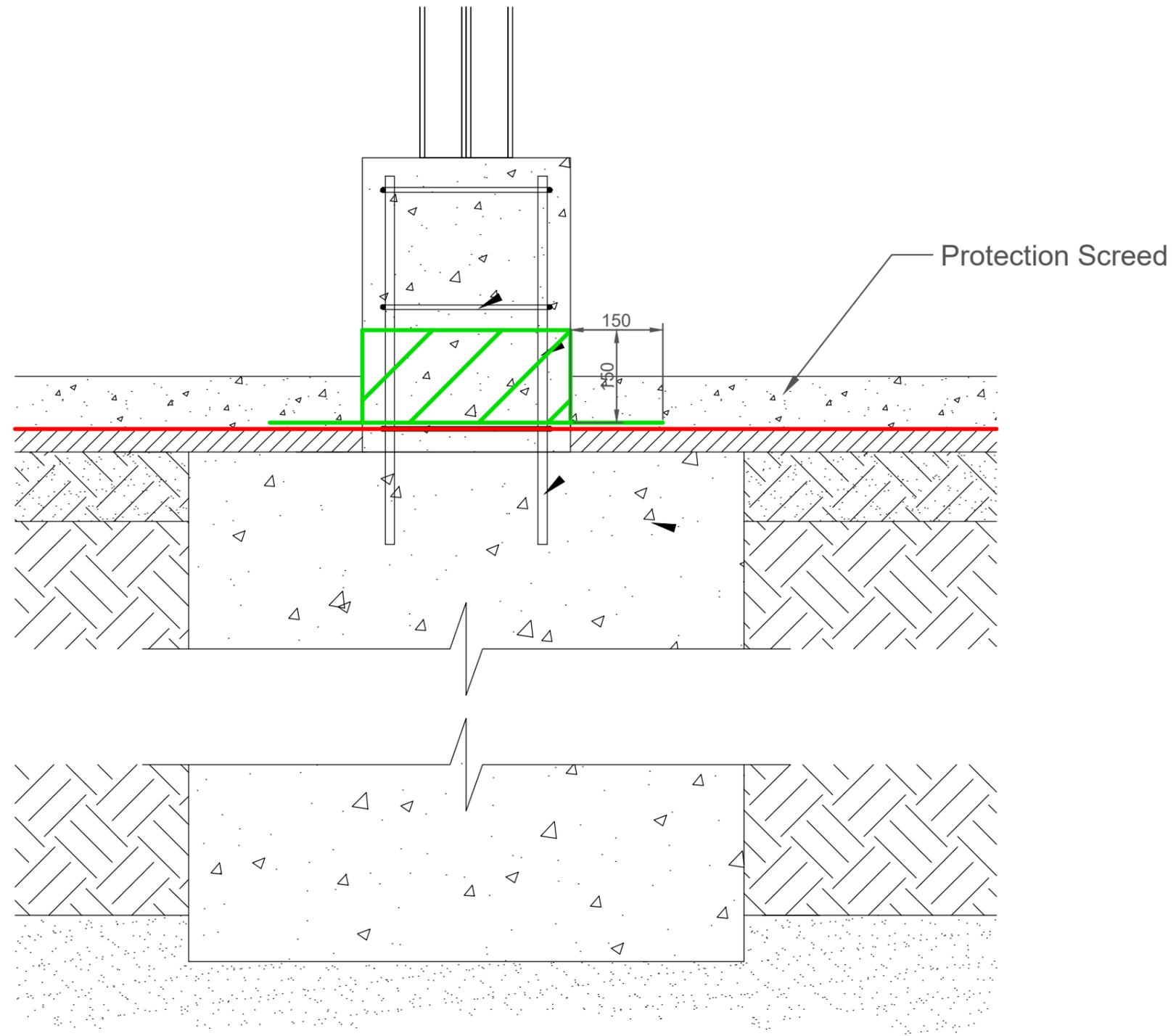
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- Proctor GM Flashing

DRAWING TITLE
Typical Perimeter Detail Between Plinths

DRAWING NUMBER
GEO104074.01b

DRAWN BY OC	CHECKED BY PC	SCALE NOT TO SCALE	DATE 23/10/23
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CLIENT
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PROJECT
Dewsbury



- NOTES
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 - All corners and penetrations to be sealed with Proctor GM Flashing

- Key
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 -  Proctor GM Flashing

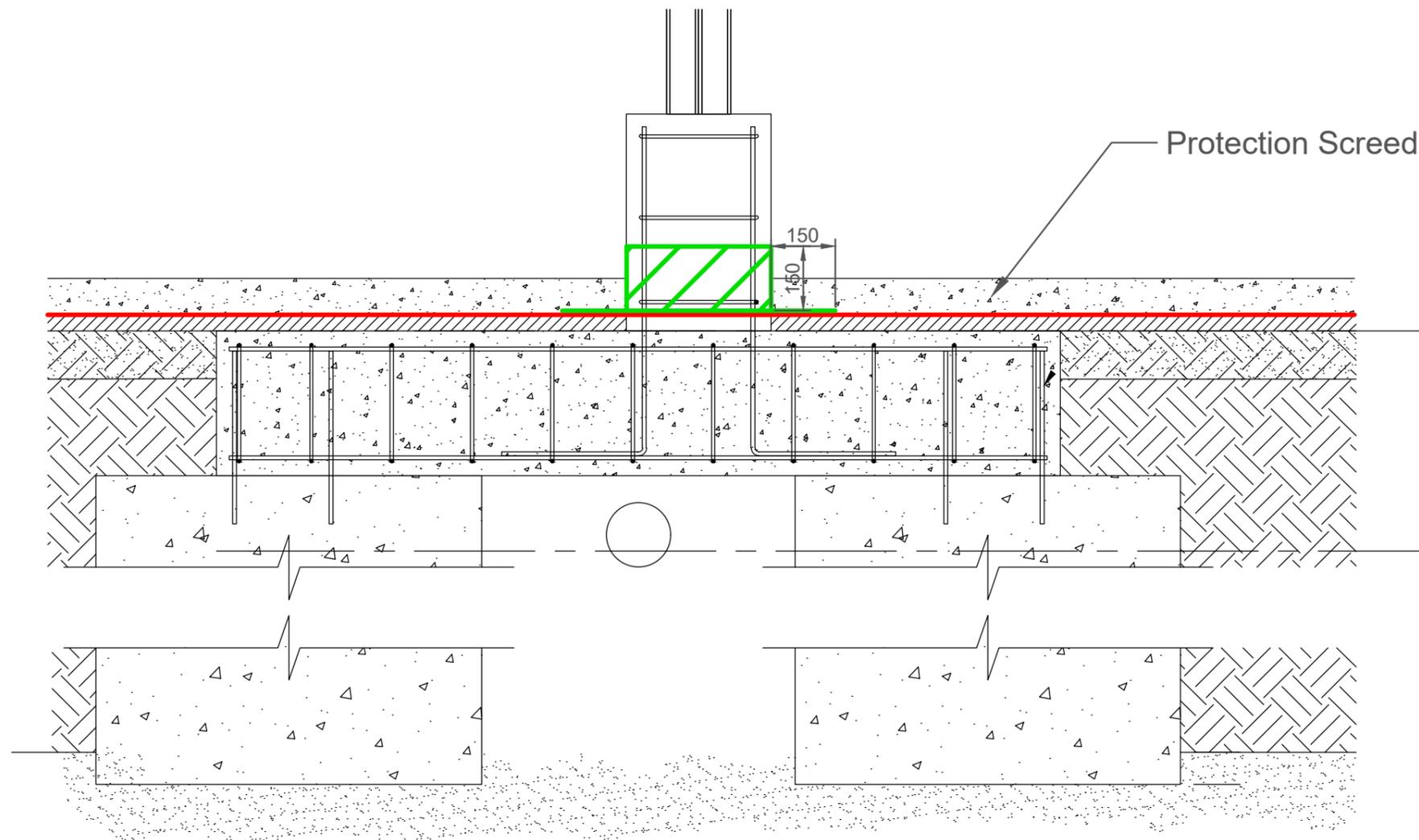
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Typical Plinth Detail

DRAWING NUMBER
GEO104074.02a

DRAWN BY OC	CHECKED BY PC	SCALE NOT TO SCALE	DATE 23/10/23
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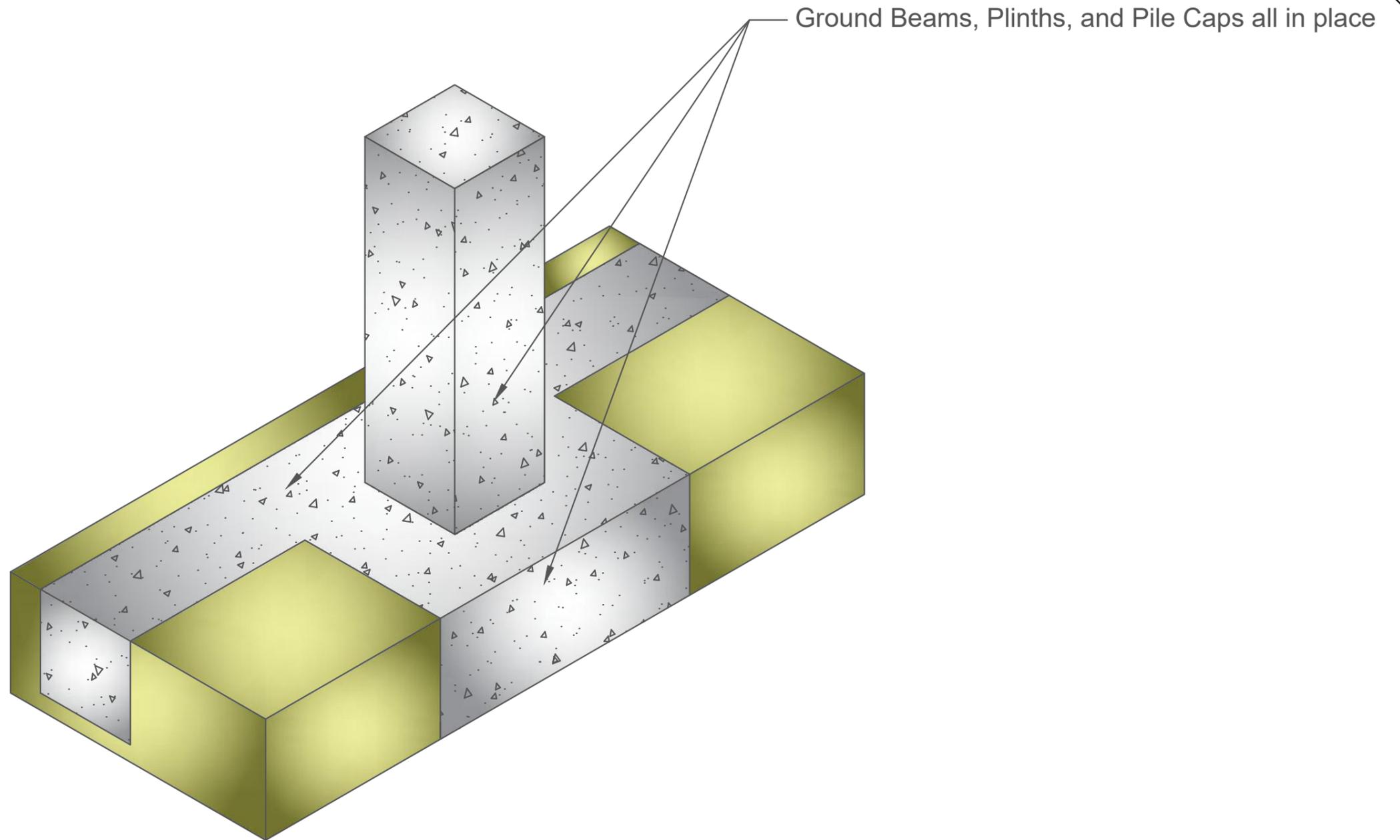
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Plinth Spanning Pipe Detail

DRAWING NUMBER
GEO104074.02b

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NOTES

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- Key

- Proctor GM Super
- Proctor GM Flashing

DRAWING TITLE
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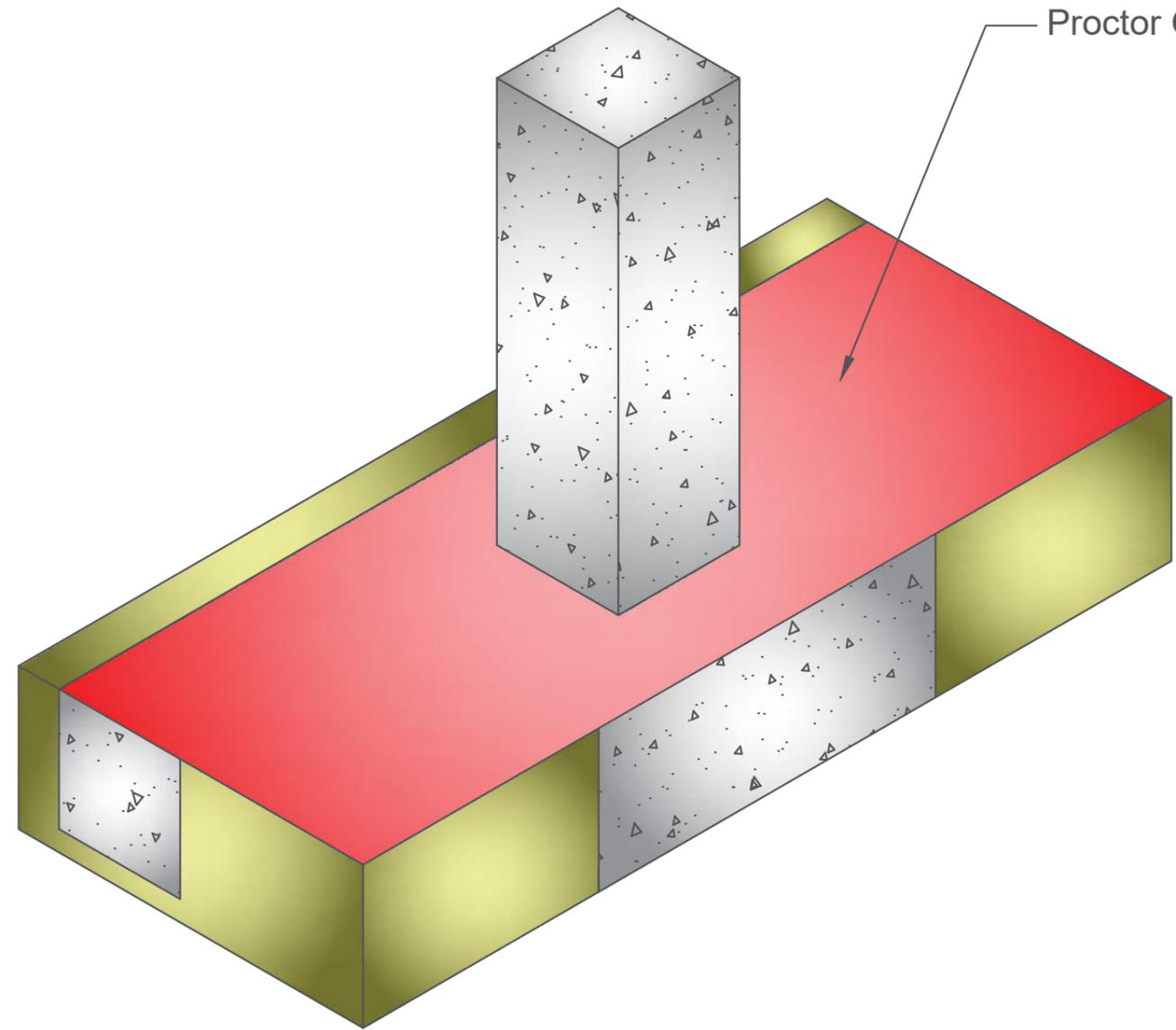
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DRAWN BY	CHECKED BY	SCALE	DATE
OC	PC	NOT TO SCALE	23/10/23



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Proctor GM Super installed tightly around Plinths

CLIENT
Darwin Group

PROJECT
Dewsbury



NOTES

- Proctor GM Super installed as per manufacturers guidance
- All corners and penetrations to be sealed with Proctor GM Flashing

- Key

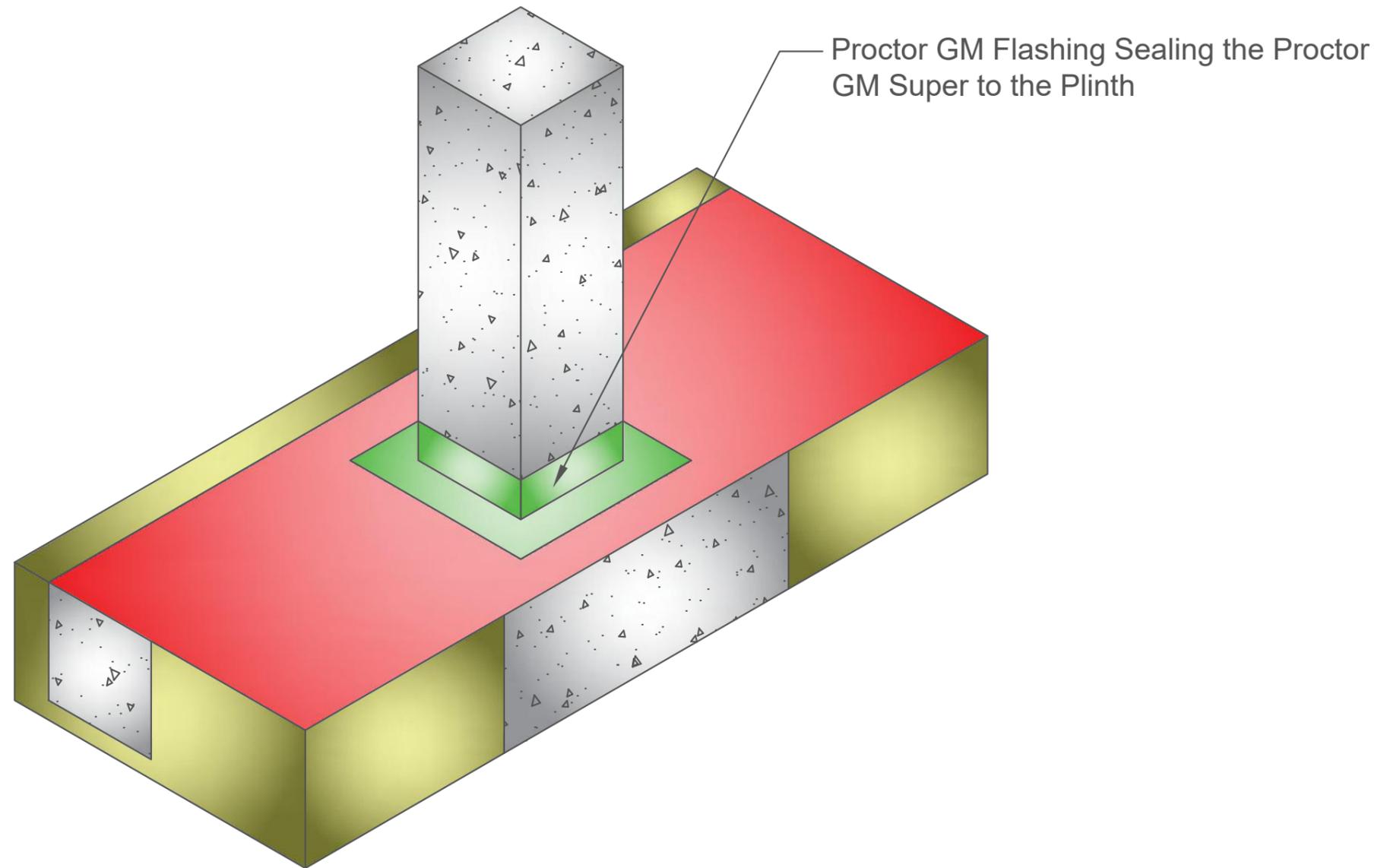
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- Proctor GM Flashing

DRAWING TITLE
Perimeter Detail Part 2

DRAWING NUMBER
GEO104074.03b

DRAWN BY OC	CHECKED BY PC	SCALE NOT TO SCALE	DATE 23/10/23
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CLIENT
Darwin Group

PROJECT
Dewsbury



NOTES

- Proctor GM Super installed as per manufacturers guidance
- All corners and penetrations to be sealed with Proctor GM Flashing

- Key

- Proctor GM Super
- Proctor GM Flashing

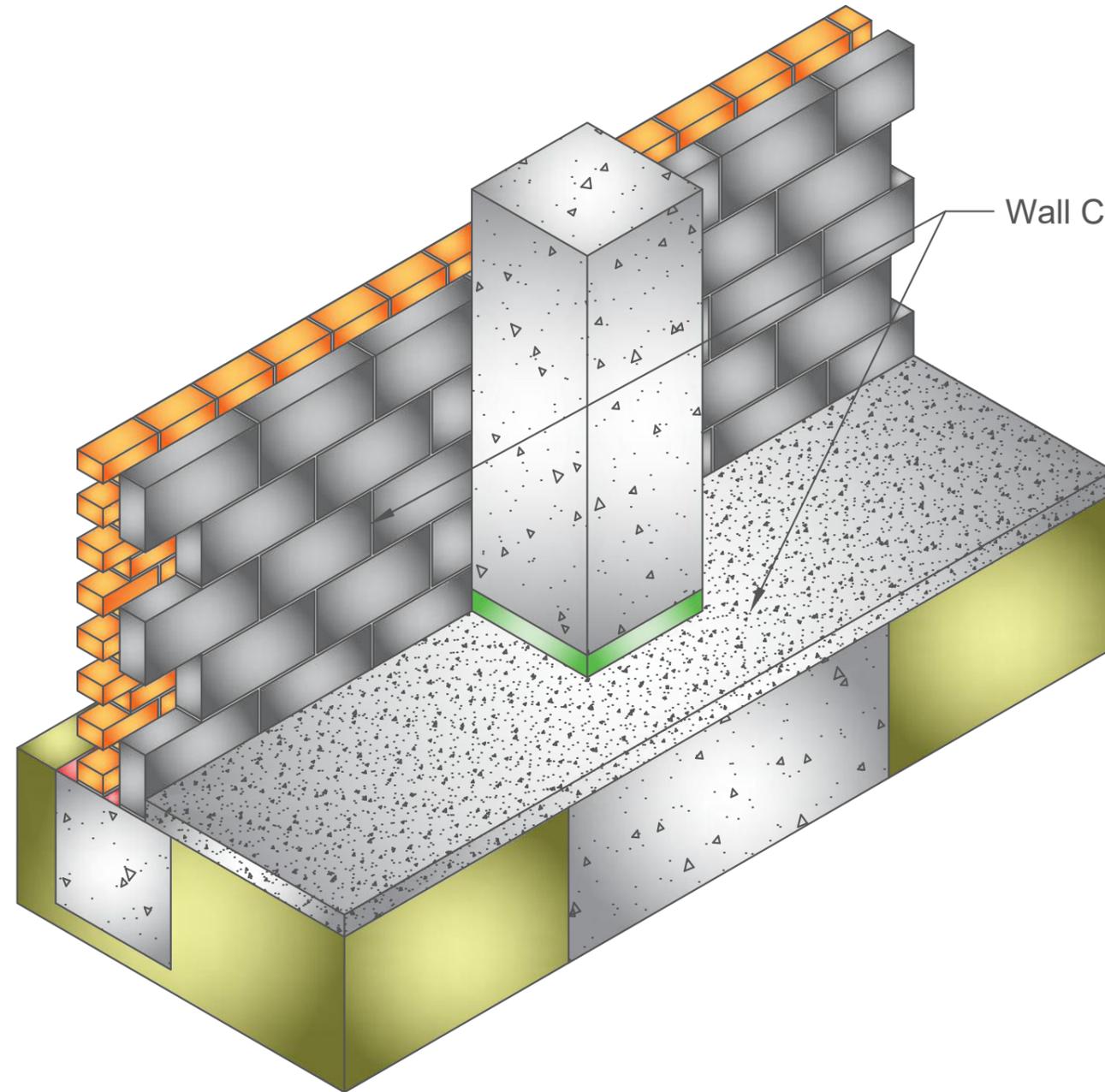
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Perimeter Detail Part 3

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GEO104074.03c

DRAWN BY	CHECKED BY	SCALE	DATE
OC	PC	NOT TO SCALE	23/10/23



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Wall Constructed and Protection Screen Poured

CLIENT
Darwin Group

PROJECT
Dewsbury



NOTES

- Proctor GM Super installed as per manufacturers guidance
- All corners and penetrations to be sealed with Proctor GM Flashing

- Key

- Proctor GM Super
- Proctor GM Flashing

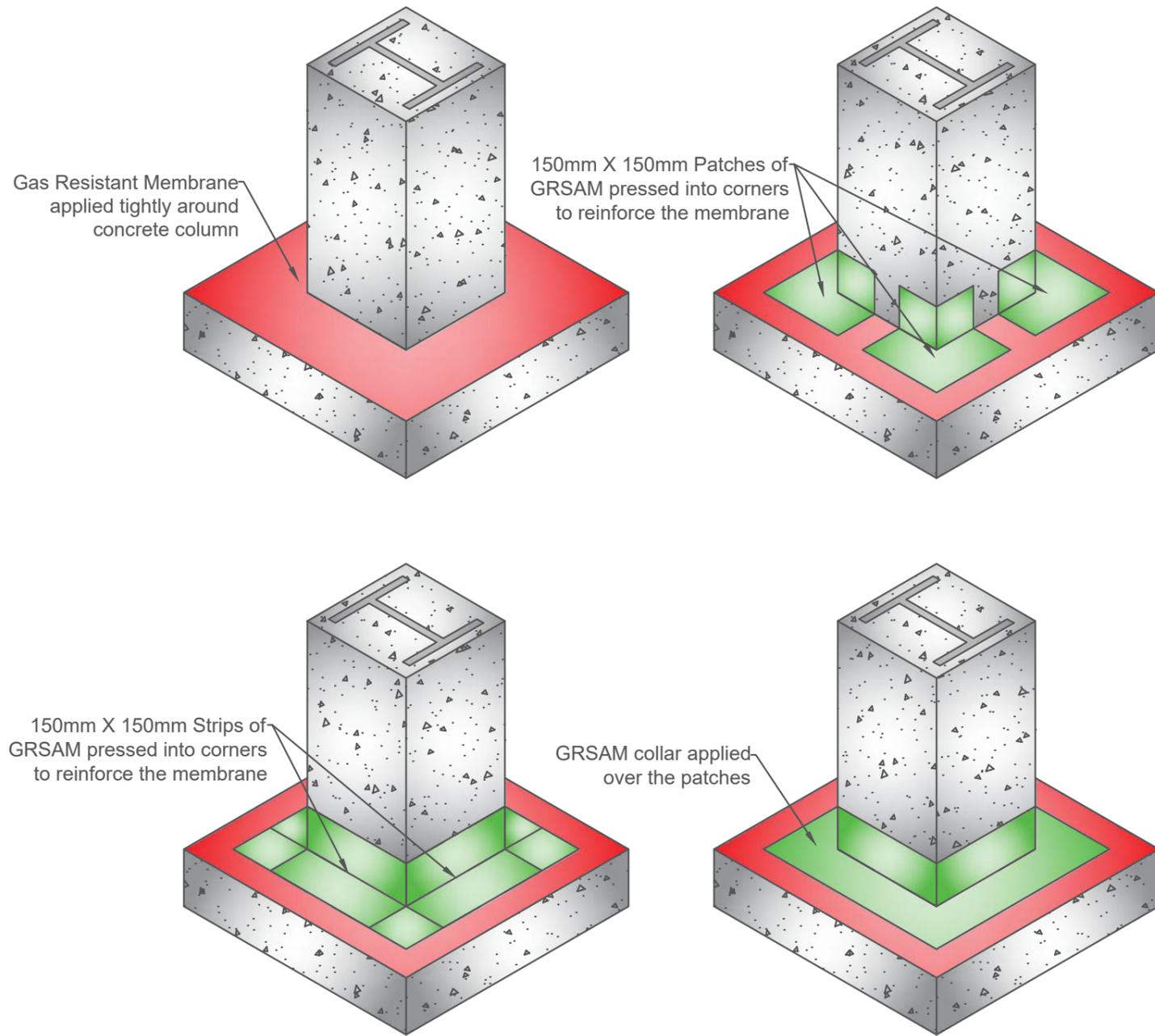
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DRAWING NUMBER
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DRAWN BY OC	CHECKED BY PC	SCALE NOT TO SCALE	DATE 23/10/23
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CLIENT
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PROJECT
Dewsbury



- NOTES
- Proctor GM Super installed as per manufacturers guidance
 - All corners and penetrations to be sealed with Proctor GM Flashing

- Key
-  Proctor GM Super
 -  Proctor GM Flashing

DRAWING TITLE
Concrete Column Detail

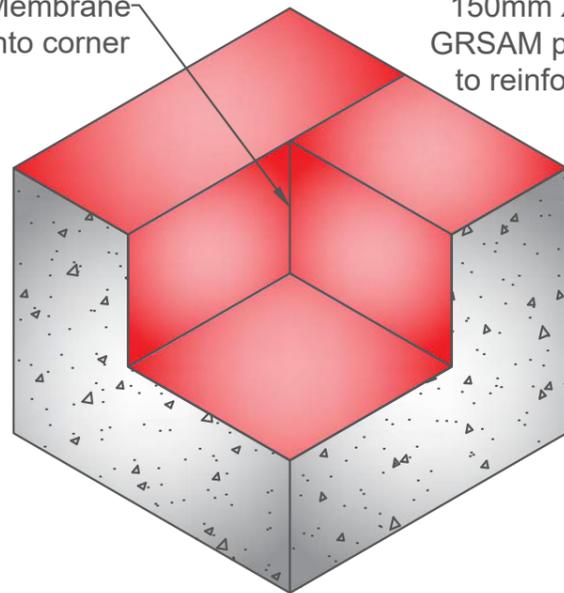
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DRAWN BY OC	CHECKED BY PC	SCALE NOT TO SCALE	DATE 23/10/23
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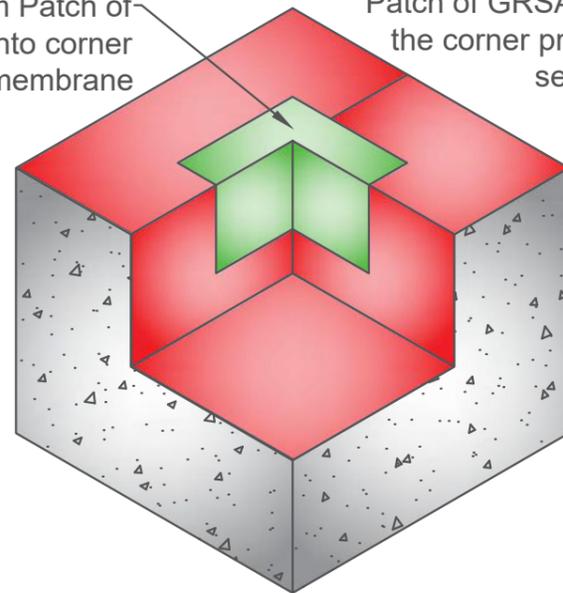


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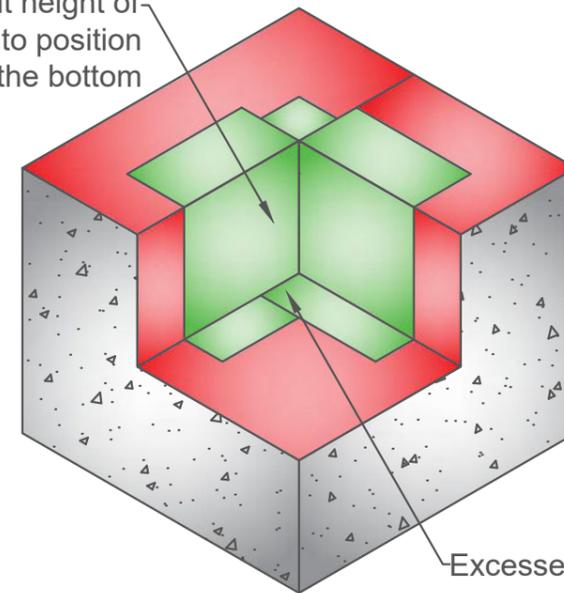
Gas Resistant Membrane Laid into corner



150mm X 150mm Patch of GRSAM pressed into corner to reinforce the membrane

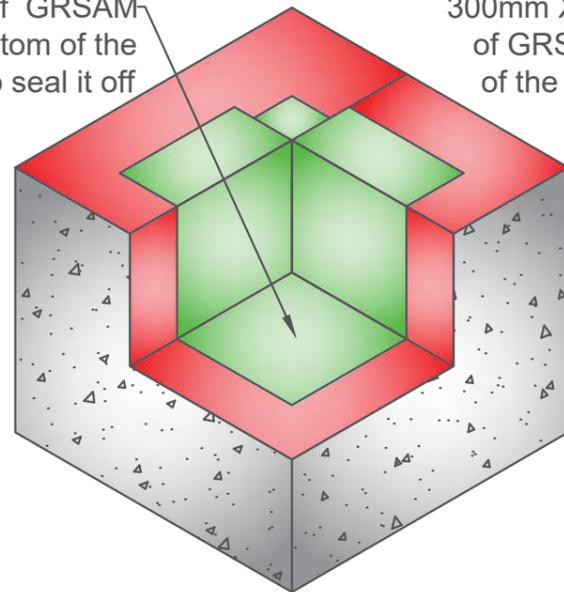


Patch of GRSAM to suit height of the corner pressed into position sealing to the bottom

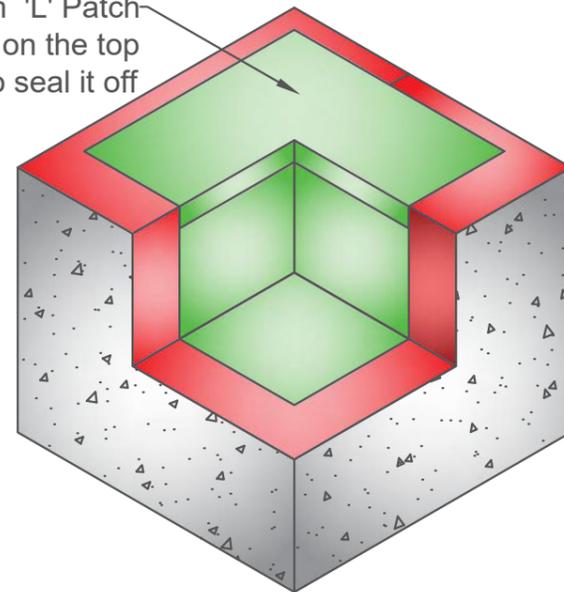


Excesses GRSAM folded over and pressed down to create a seal

150mm X 150mm Patch of GRSAM pressed on the bottom of the corner to seal it off



300mm X 300mm 'L' Patch of GRSAM laid on the top of the corner to seal it off



CLIENT
Darwin Group

PROJECT
Dewsbury



NOTES

- Proctor GM Super installed as per manufacturers guidance
- All corners and penetrations to be sealed with Proctor GM Flashing

- Key

-  Proctor GM Super
-  Proctor GM Flashing

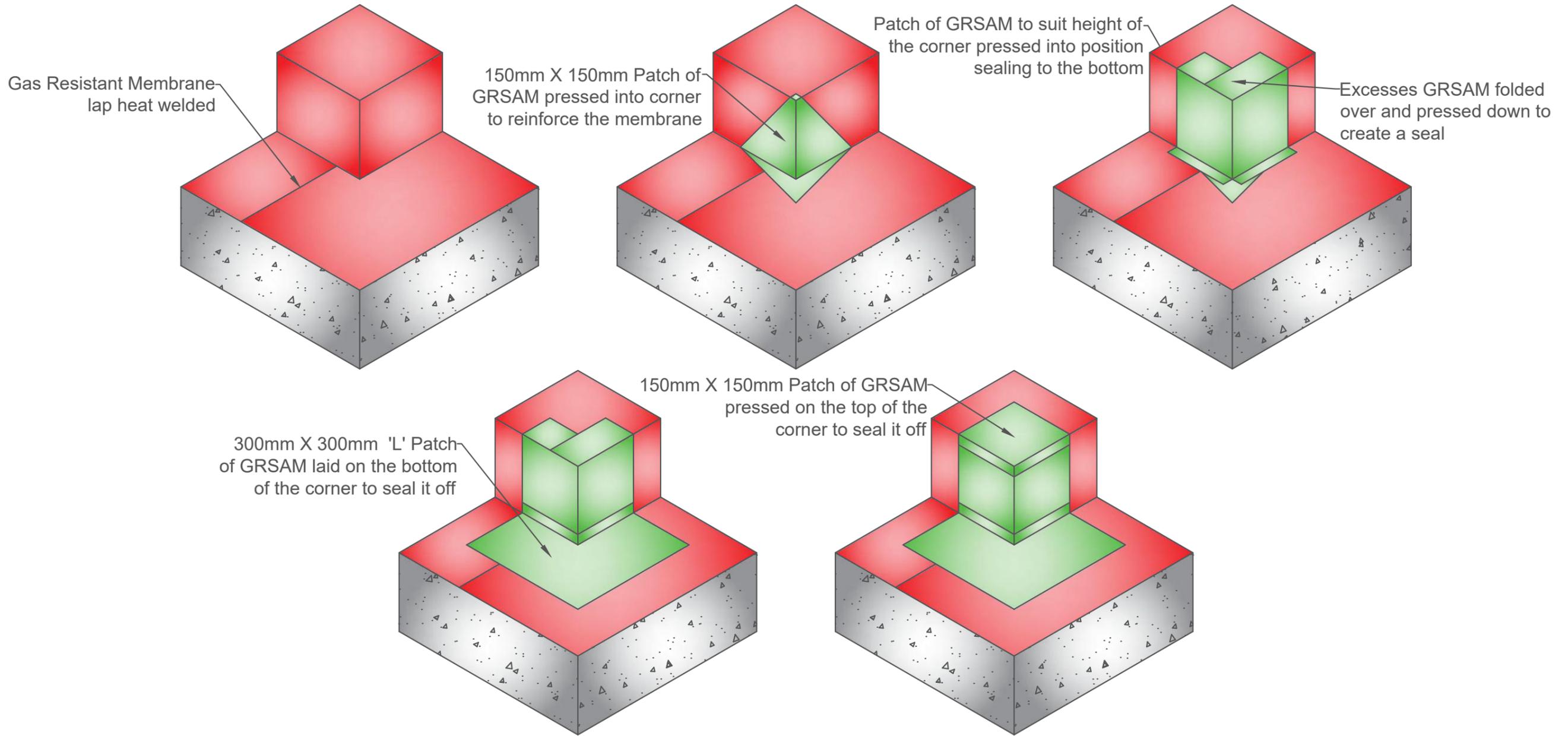
DRAWING TITLE
Internal Corner Detail

DRAWING NUMBER
GEO104074.06a

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CLIENT
Darwin Group

PROJECT
Dewsbury



- NOTES
- Proctor GM Super installed as per manufacturers guidance
 - All corners and penetrations to be sealed with Proctor GM Flashing

- Key
- Proctor GM Super
 - Proctor GM Flashing

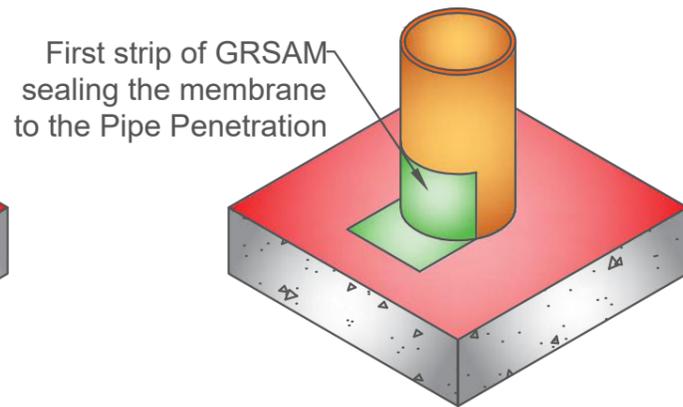
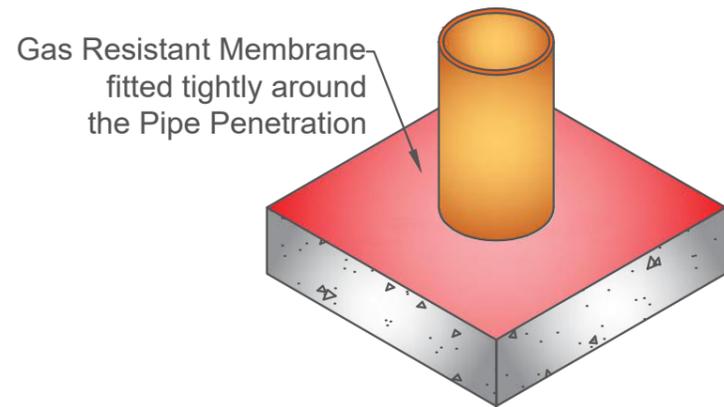
DRAWING TITLE
External Corner Detail

DRAWING NUMBER
GEO104074.06b

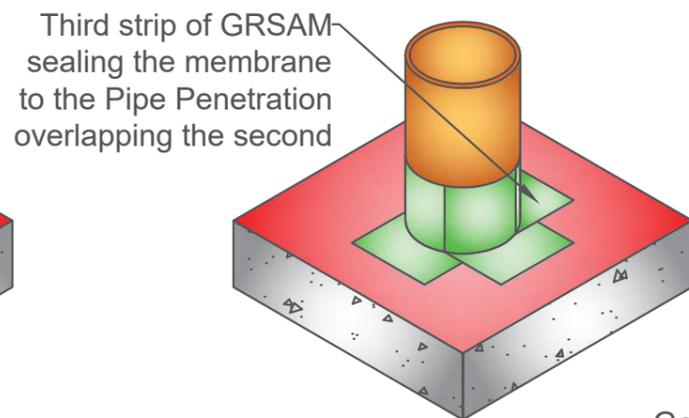
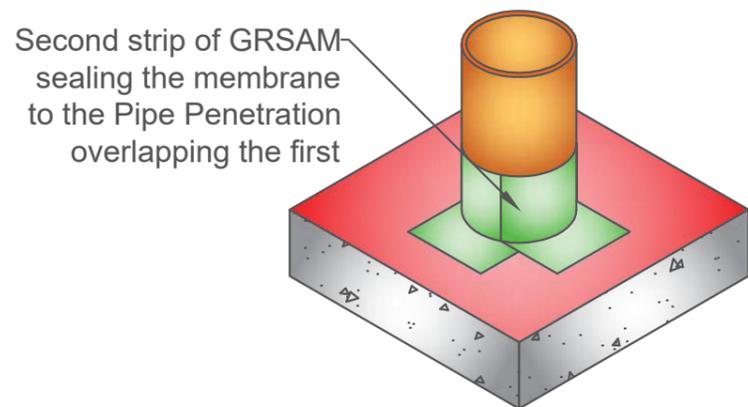
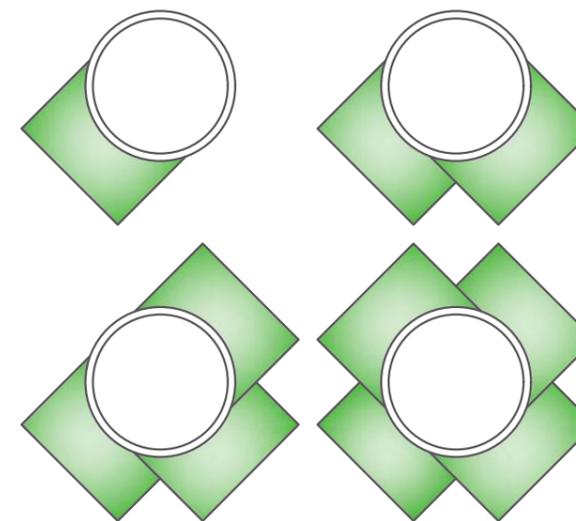
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PLAN VIEW OF DETAIL



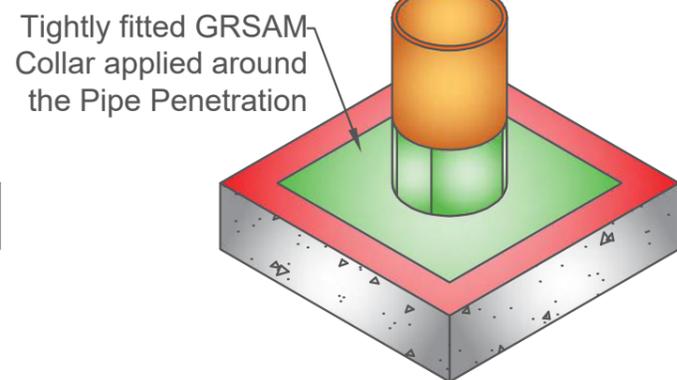
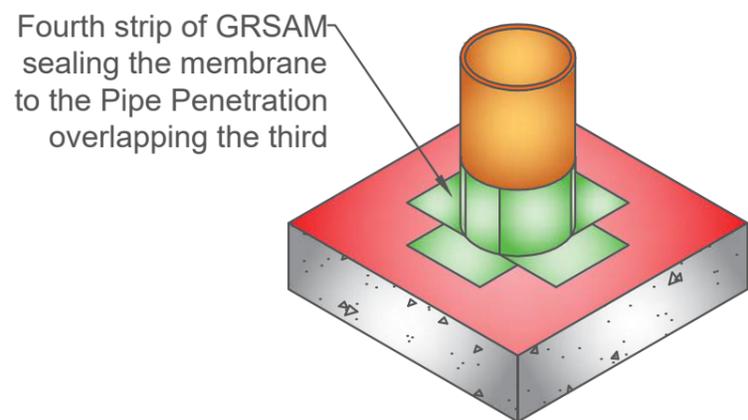
EXAMPLE PHOTOGRAPH



Gas Resistant Membrane fitted around Pipe Penetration

Strips of GRSAM sealing the membrane to the Pipe Penetration

GRSAM Collar applied around Pipe Penetration



CLIENT
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PROJECT
Dewsbury



- NOTES
- Proctor GM Super installed as per manufacturers guidance
 - All corners and penetrations to be sealed with Proctor GM Flashing

- Key
- Proctor GM Super
 - Proctor GM Flashing

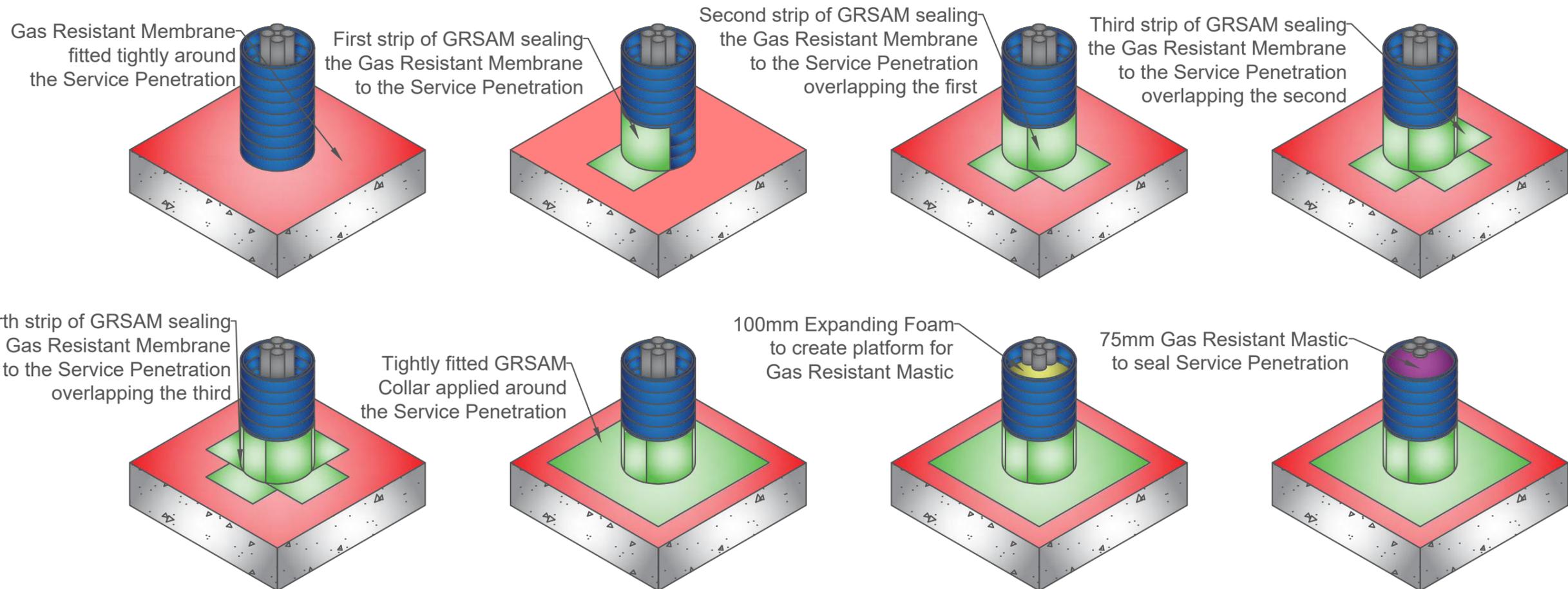
DRAWING TITLE
Pipe Penetration Detail

DRAWING NUMBER
GEO104074.07a

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PROJECT
Dewsbury



NOTES

- Proctor GM Super installed as per manufacturers guidance
- All corners and penetrations to be sealed with Proctor GM Flashing

- Key

-  Proctor GM Super
-  Proctor GM Flashing
-  100mm Expanding Foam
-  75mm Gas Resistant Mastic

DRAWING TITLE
Service Penetration Detail

DRAWING NUMBER
GEO104074.07b

DRAWN BY OC	CHECKED BY PC	SCALE NOT TO SCALE	DATE 23/10/23
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SPECIFICATION

Protech GM Super

GAS PROTECTION

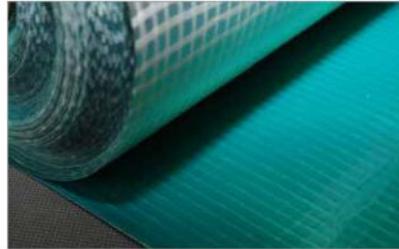
• HIGH RISK CHARACTERISTIC SITES •

REGULATIONS COMPATIBILITY TABLE

	CIRIA 665 CHARACTERISTIC SITUATION 2	CIRIA 665 CHARACTERISTIC SITUATION 3-4	B58485 CHARACTERISTIC SITUATION 2	B58485 CHARACTERISTIC SITUATION 3-4	BRE 211 RADON	NHBC AMBER 1	NHBC AMBER 2 & RED
METHANE	✓	✓	✓	✓	N/A	✓	✓
CARBON DIOXIDE	✓	✓	✓	✓	N/A	✓	✓
RADON	N/A	N/A	N/A	N/A	✓	N/A	N/A

DESCRIPTION

Protech GM Super is a high performance proprietary reinforced gas barrier; that incorporates a 12 micron aluminium foil layer for maximum protection against ground-borne gases. This has been specifically designed to conform with the latest guidance documents. Due to its unique composition, the membrane is extremely robust and flexible and, therefore, easy to install on site. The membrane also provides protection from damp when placed below the slab and, therefore, there is no need to install a separate DPM.



SPECIFICATION

CIRIA C665, B58485:2015 & Local Authority Ground Gas Handbook recommended that gas membranes are specified on the basis of the 'need to survive' construction, i.e. use one that is puncture and tear resistant.

Thickness should not be the main determinant of the suitability of a membrane for a particular site, although it can indirectly influence some key performance parameters.

In practise, because of the nature of construction sites, the durability, survivability and robustness of membranes are equally important than purely permeability to gas.

Protech GM Super incorporates a reinforced grid to ensure that maximum protection is achieved when installed to manufacturers' instructions.

The need for high quality workmanship during installation should not be underestimated. The health and safety of the occupants of the building is dependent on its satisfactory performance. If installed incorrectly or damaged during the construction process, the membrane is rendered ineffective and will fail to provide adequate protection against the ingress of ground gas or vapours.

TYPICAL PROPERTIES

Roll Length	50m
Width	2m
Weight	370g/m ²
Thickness	0.4mm
Colour	Green / Silver
Methane Permeability (ISO 15105-1)	≤ 0.1 m/day/m ²

REQUIRED ACCESSORIES

- Protech GM Super Starter Band (1m x 50m)
- Protech GM Tape
- Protech GM Tophats
- Protech SAGM (Self Adhesive Gas Membrane)
- Protech GM Flashing Strip
- Protech GM Super Corner Units
- Protech GM Primer
- Protech GM 3mm Protection Board
- Protech GM Protection Fleece
- Protech 125

VENTING

On sites where venting is required, our Provoid Venting System should be used. We can provide design advice for both passive and active venting systems to suit individual site requirements.



Revised April 2021

Title Reference & Description:

Protech GM Super Gas Barrier Technical Data Sheet

 BGA
British Geomembrane Association

GeoShield Verification Plan



SPECIFICATION

DATA SHEET

Protech GM Flashing Strip

GAS PROTECTION

THE PRODUCT

Protech GM Flashing Strip is a waterproof and gas resistant tape comprising of an aluminium / polythene laminate, coated on one surface with a layer of self adhesive polymer modified bitumen. The adhesive bituminous compound is protected, until use, by a release liner.

USES

- Sealing around column penetrations
- Repairing / patching membranes damaged during installation
- Reinforcing corners and other detailing

PREPARATION OF INSTALLATION SURFACE

Protech GM Flashing Strip adheres and is compatible with most building materials, Protech GM Primer may be required depending on substrate. No special tools are required to install Protech GM Flashing Strip, a sharp knife and a pressing roller will be enough. The surfaces on which to install the Protech GM Flashing Strip must be dry and compact, clean and free of impurities. The product comes with an outer release liner, which should only be removed at the time of use. Installation must not be carried out below 5°C and some warming with hot air gun may be required between the temperature of 5°C and 10°C to ensure a satisfactory seal. In cold weather try to ensure rolls are stored in a warm environment to ease installation.

INSTALLATION PROCEDURES

Prepare the surface and proceed as follows:

- Choose the most suitable width and metal finish of the Protech GM Flashing Strip;
- Remove the release film that covers the Flashing Tape and position the Protech GM Flashing Strip;
- Press with a roller or a cloth pad.

In case of overlapping, please use at least 50mm.

Dimensions and Packaging

Standard length: 10m

Standard thickness: 1mm

Standard width:
Protech GM Flashing Strip: 300mm

Other widths, lengths and thicknesses are available on request.
The rolls are boxed 4 per carton.

Title Reference & Description:

Protech GM Flashing Strip Technical Data Sheet



GeoShield Verification Plan



SPECIFICATION

DATA SHEET

Protech GM Flashing Strip

TECHNICAL DATA

Property	Test	Value
Water tightness to liquid water	EN 1928	Pass
Resistance to Static Load	EN 12730	20kg Pass
Tensile Strength Properties	EN 12311-2	MD ≥ 2 N/mm ² CD ≥ 2 N/mm ²
Elongation at Break	EN 12311-2	MD ≥ 120% CD ≥ 120%
Durability of Watertightness against ageing	EN 1847 Method A 60 KPa	Pass
Durability of Watertightness against chemicals	EN 1847 Method A 60 KPa	Pass
Resistance to Impact	EN 12691	≥ 500mm
Resistance to tear (Nail Shank)	EN 12310-1	MD ≥ 100 N CD ≥ 100 N
Reaction to Fire	EN 13501	Class F
Joint Strength	EN 12317-2	≥ 30 N
Water Vapour Transmission (Density Flow rate)	EN 1931	0.013 g/(day/m ²)
Water Vapour Transmission (Resistance factor, μ)	EN 1931	2380000 μ
Length	EN 1848-2	10m
Width	EN 1842-2	300mm
Thickness	EN 1849-2	1.00mm
Mass	EN 1849-2	1100g/m ²
Other Data		
Methane GTR	ISO 15105-1	<10 ml/m ² .day
Carbon dioxide GTR	ISO 15105-1	<10 ml/m ² .day
Radon Diffusion		5.0 × 10 ⁻¹⁴
Roll Weight		33kg

Storage: Keep material upright, away from direct sunlight in cool, dry conditions.

Caution and Safety: The material is not hazardous for normal uses and when used by skilled persons. In particular conditions, it is possible to cut or injure oneself. Keep out of reach of children. For further information refer to the Safety Data Sheet.

This datasheet is intended as a general guide and does not constitute a warranty of specification.



Download a full Gas Protection brochure from our website...
www.proctorgroup.com



Title Reference & Description:

Protech GM Flashing Strip Technical Data Sheet



GeoShield Verification Plan



CLIENT DETAILS

CLIENT CONTACT: Cameron Reed

CONTACTS ROLE: Design Manager

MOBILE PHONE:

EMAIL ADDRESS:

CLIENT CONTACT:

CONTACTS ROLE:

MOBILE PHONE:

EMAIL ADDRESS:

NOTES:



GeoShield Verification Plan



APPLICATOR'S DETAILS

APPLICATOR NAME:

COMPANY:

APPLICATOR TEL:

APPLICATOR EMAIL:

APPLICATOR NAME:

COMPANY:

APPLICATOR TEL:

APPLICATOR EMAIL:

NOTES:



GeoShield Verification Plan



HEALTH AND SAFETY

INDUCTION:

YES



NO:



INDUCTION TIME:

CSCS CARD:

YES



NO:



CSCS CARD NUMBER:

13466546

METHOD STATEMENT:

YES



NO:



RISK ASSESSMENT:

YES



NO:



COSHH:

YES



NO:



SITE SPECIFIC HAZARDS:

Materials falling from height

Slips, trips and falls

Excavations

Confined spaces

Plant



GeoShield Verification Plan



APPLICATOR'S DETAILS

TRAINING LEVEL:

SPECIALIST CONTRACTOR:	<input type="checkbox"/> YES	<input type="checkbox"/>	<input type="checkbox"/> NO	<input checked="" type="checkbox"/>
NVQ LEVEL 2:	<input type="checkbox"/> YES	<input type="checkbox"/>	<input type="checkbox"/> NO	<input checked="" type="checkbox"/>
COMPETENT APPLICATOR:	<input checked="" type="checkbox"/> YES	<input checked="" type="checkbox"/>	<input type="checkbox"/> NO	<input type="checkbox"/>
TOOLBOX BY GEOSHIELD:	<input checked="" type="checkbox"/> YES	<input checked="" type="checkbox"/>	<input type="checkbox"/> NO	<input type="checkbox"/>

REASON FOR VISIT:

DURING INSTALLATION:	<input checked="" type="checkbox"/>	UNDERSLAB VENTILATION	<input type="checkbox"/>
PRE - POUR:	<input checked="" type="checkbox"/>	DPC MEMBRANE CONNECTION	<input type="checkbox"/>
TESTING:	<input checked="" type="checkbox"/>	OTHER (PLEASE SPECIFY):	<input checked="" type="checkbox"/>

passive subfloor void connected to air bricks above the gas membrane and protection screed.

NOTIFICATION:

24 HOURS:	<input type="checkbox"/> YES	<input checked="" type="checkbox"/>	48 HOURS:	<input type="checkbox"/> YES	<input checked="" type="checkbox"/>
-----------	------------------------------	-------------------------------------	-----------	------------------------------	-------------------------------------

NOTES: It will be deemed that these applicators are at an appropriate skill level for the job of installing the ground gas protection measures.
 Toolbox talk training will be provided by Geoshield for the management team and installers, should it be required.



GeoShield Verification Plan



New hospital building

In accordance with guidance from CIRIA 735 & CIRIA C748.

Radon gas protection measures specify to the guidance from the BR 211 document:

VOC/Hydrocarbons

RADON BASIC

RADON FULL

Characteristic Specification (CS) Rating

CS2

Building Type:

TYPE B

POINTS REQUIRED UNDER BS8485:2019

3.5 POINTS

POINTS GAINED FROM BS8485:2019

Score for Structural Barrier:

0 POINTS

Grade 2 Basement:

N/A

Grade 3 Basement:

N/A

Score for Venting:

1.5 POINTS

Car Park:

N/A

Score for Membrane:

2.0 POINTS

POINTS ACHIEVED UNDER BS8485 2019:

3.5 POINTS



GeoShield Verification Plan



TESTING PROCEDURES

VISUAL: PICK & PROBE/MECHANICAL POINT STRESS TEST:

NON-DESTRUCTIVE COMPRESSED AIR LANCE TEST:

NON-DESTRUCTIVE SMOKE TEST:

DESTRUCTIVE JOINT TESTING:

NON-DESTRUCTIVE TRACER GAS TESTING:

DIELECTRIC POROSITY TEST:

PUMP TEST FOR "Twinny" WELD

NOTES: From the risk assessment GeoShield will initially conduct a visual

NOTES: and pick and probe testing regime for this project.

NOTES: Air lance testing will be conducted to test the installed membrane in

NOTES: accordance with CIRIA 735.

NOTES:

NOTES: Only if the application falls below the accepted standard will other testing

NOTES: be used.

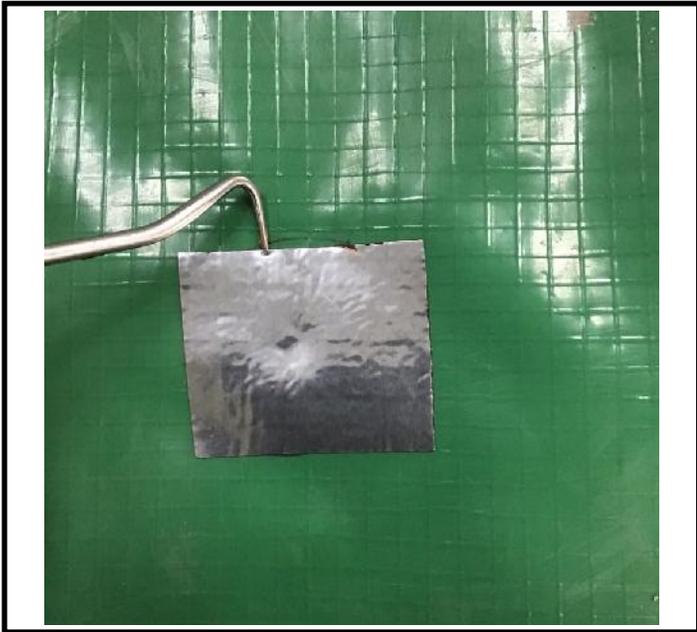


GeoShield Verification Plan



SPECIFICATION

Mechanical Point Stress/ 'Pick and Probe' Testing



CIRIA 735

4.3.2 - Mechanical point stress tests involve running a blunt instrument (e.g. a screwdriver) along the edge of a seam to identify any unbonded seams. This method is not as effective as air lancing but it can be especially useful in hard to reach areas where it is not possible to air lance.

The instrument used should not puncture the gas membrane. This method is less appropriate for materials that are easily punctured where an air lance test is more suitable (although if a gas membrane can be easily punctured its suitability as a membrane is open to question).



GeoShield Verification Plan



SPECIFICATION

Air Lance Testing



CIRIA 735

4.3.3 - Air lance testing identifies unbonded areas of seam by directing a high pressure jet of air at the seam. The air is at a minimum pressure of 345kPa via a 4.8mm nozzle and is located no more than 50mm from the seam being tested.

In order to achieve the requirements of ASTM D4437-08:2013 bespoke specialist equipment is required to maintain the required pressure.



GeoShield Verification Plan



RISK ASSESSMENT

SITE SPECIFIC CIRCUMSTANCES	1	2	3	4	5
Complexity of Design	1	2 ✓	3	4	5
Repetition of Design	1 ✓	2	3	4	5
Experience of Workforce	1	2 ✓	3	4	5
Gas Regime	1	2 ✓	3	4	5
Project Management Experience	1	2 ✓	3	4	5
Installation Conditions (exposed?)	1	2 ✓	3	4	5
Robust Project Specific Gas Design	1 ✓	2	3	4	5

TYPE OF RISK	RANGE	RISK
High Risk	23 - 30	High Risk
Medium High Risk	19 - 22	19
Medium Risk	15 - 18	Medium Risk
Medium Low Risk	11 - 14	Medium Low Risk
Low Risk	0 - 10	Low Risk

GeoShield have classed this project as a medium high risk.

GeoShield will lay all parameters down for standards at the pre-verification meeting to assist both the installer and the main contractor.



GeoShield Verification Plan



VERIFICATION REPORT

These items will be included in the report

- NUMBER 1 GAS MEMBRANE SPECIFICATION
- NUMBER 2 ELEMENTS OF THE GAS MEMBRANE
- NUMBER 3 DATE, TIME and WEATHER CONDITIONS
- NUMBER 4 PLANS and DETAILS ISSUED
- NUMBER 5 INSTALLATION PHOTOS RELATING TO GRID LINES
- NUMBER 6 REPORTING DEFECTS AND LOGGING IN REMEDIATION LOG
- NUMBER 7 AREAS OF LIMITATION (areas unable to inspect)
- NUMBER 8 LOGGING AND REPORTING RESULTS OF TESTING

VERIFICATION REPORT ISSUE

HARD COPY: YES NO EMAIL: YES NO

DROP BOX LINK: YES NO FLASH DRIVE: YES NO



GeoShield Verification Plan



GEOSHIELD COMPETENCE

>GeoShield was founded in 2015.

>GeoShield solely verifies, they are fully independent of installers, manufacturers and geotechnical companies.

>GeoShield follow guidance in CIRIA 735 (sufficient experience, membership of relevant professional organisations). GeoShield are members of the BVC, BGA, ERA, The RADON Council, and UKRA.

>Currently GeoShield hold the Chairmanship of the British Verification Council.

>Two employees are NSAC Level 3 Assessors for the NVQ 2 Gas Membrane install.

>GeoShield were key in forming the NVQ 4 Verification qualification in which 2 Verification Officers are undertaking this qualification.

>GeoShield have the only qualified Assessor for the NVQ 4 Verification qualification.

>GeoShield Verification Officers currently keep up to date CPDs.

>All GeoShield Verification Officers have a full understanding of gas membrane install, including 3 experienced (NVQ 2) Installers in the GeoShield team.

>GeoShield Verification Officers are all independent carrying their own air compressors. Other testing equipment GeoShield have access to are 2 x Buckley Dielectric Testing machines and also inert gas testing equipment.



GeoShield Verification Plan



METHOD STATEMENT - Page 1

EXPECTED VISITS:- 5 site visits are expected in line with the proposed build

programme, additional visits may be considered (if required) to achieve sign off.

TESTING:- Mechanical Point Stress (Pick & Probe) testing on welded areas.

Air lance testing will be carried out (as per CIRIA C735 Annex 1, Table A3).

Only if the application falls below the accepted standard will other testing be used.

This project will NOT achieve sign off for gas membrane installation unless

independent verification is carried out.

PURPOSE:- Geoshield are 3rd party gas membrane verifiers in accordance with

CIRIA 735 and for this project to be compliant with BS8485:2019, the gas system

must meet certain criteria from Tables 5, 6 & 7 to achieve mitigation of score for

verification. The chosen membrane must be verified by Geoshield to ensure the

materials have been installed in accordance with the manufacturer's specification.

REPORTING:- Each site visit will be accompanied with a written and electronic report.

Any remediations either completed on the visit or outstanding will be recorded

and logged, sign off will not be achieved for each section area until all

remediations have been completed. This will be fully recorded at all times.



GeoShield Verification Plan



METHOD STATEMENT - Page 2

GROUND GAS RISK:- From the ground monitoring summary report, this project has been classified as a Type B building and a CS2 rating in accordance with BS8485:2015+A1 2019, so this project will require a minimum score of 3.5 points for mitigation. Basic Radon protection measures are required. This will be achieved by 3rd party verification of the gas membrane, a concrete pad foundations and ventilation provisions, where applicable to the site specific design. A combination of which will achieve the necessary requirements.

GAS MEMBRANE PROTECTION:- It is advised that the substrate should be prepared by removal of loose stone and debris. Other forms of protection could be in the form of either a protection board, geotextile fleece and insulation. In addition labels will be issued by Geoshield to restrict access to the installed area by follow on trades and help raise awareness to encourage a better duty of care. This will help to reduce the risk of potential damage caused to the gas membrane system.

FINAL:- Geoshield will liaise with the projects site supervision and all relevant parties prior to the installation start. This plan will be presented and reviewed, all points made clear as previously stated. Any alterations will be listed at the end of this plan as an all party agreed way forward.

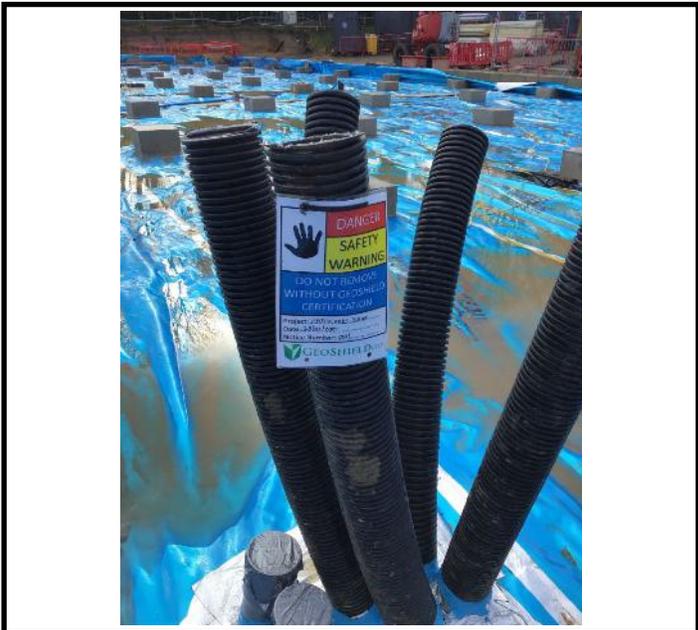


GeoShield Verification Plan



TESTING PROCEDURE

Method Statement - Pipe Penetrations and Service Entries Notice Signs



Geoshield Notice Signs -

During testing on site, notice signs will be tied to all pipe penetrations and service entries which have not passed inspection. Areas cannot be passed unless verification stickers have been applied to the Notice Signs, once remediations have been successfully carried out.



GeoShield Verification Plan



TESTING PROCEDURE

Method Statement - Membrane Sticker Notice Signs



Geoshield Notice Signs -

During testing on site, areas cannot be passed unless verification stickers have been applied, once remediations have been successfully carried out.



GeoShield Verification Plan



SUBSTRATE METHOD STATEMENT

SUBSTRATE TYPE:

Block and Beam Construction	Yes	<input type="checkbox"/>	No	<input checked="" type="checkbox"/>
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Minimum Preparation	Swept Clear	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
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Minimum Preparation	Vacuuming	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
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Minimum Preparation	Compressed air to remove	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
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Minimum Preparation	Remove Mortar Droppings	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
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Stone Substrate	Yes	<input checked="" type="checkbox"/>	No	<input type="checkbox"/>
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Minimum Preparation	Minimum 25mm Sand Blinding	Yes	<input checked="" type="checkbox"/>	No	<input type="checkbox"/>
---------------------	----------------------------	-----	-------------------------------------	----	--------------------------

Minimum Preparation	Limestone Dust	Yes	<input type="checkbox"/>	No	<input checked="" type="checkbox"/>
---------------------	----------------	-----	--------------------------	----	-------------------------------------

Minimum Preparation	Compacted Substrate	Yes	<input checked="" type="checkbox"/>	No	<input type="checkbox"/>
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Minimum Preparation	No large stones	Yes	<input checked="" type="checkbox"/>	No	<input type="checkbox"/>
---------------------	-----------------	-----	-------------------------------------	----	--------------------------

Concrete Substrate	Yes	<input type="checkbox"/>	No	<input checked="" type="checkbox"/>
--------------------	-----	--------------------------	----	-------------------------------------

Minimum Preparation	No Hollows	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
---------------------	------------	-----	--------------------------	----	--------------------------

Minimum Preparation	Troweled Surface	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
---------------------	------------------	-----	--------------------------	----	--------------------------

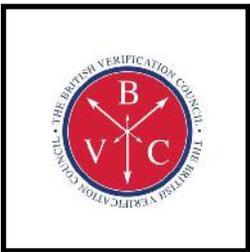
Remarks:	
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GeoShield Verification Plan



PRE-CONTRACT MEETING

Items for discussion at the Pre-Contract meeting:-

>Induction Procedure

>Identification of Installation team and point of contact

>Identification of Project Management team

>Identification of Sub-Contractors associated with membrane installation

>Validation of Membrane and Design Specification

>Verification Procedure

>Notifications for Verification

>Preparation of Substrate

>Program of Works

>Utility Entry

>Protection of Membrane

>Remediation Procedure

>Testing Procedures

>Sign off Procedure

>Installer PI

All information is assumed correct at time of issue.

DATE:



GeoShield Verification Plan



PRE-CONTRACT MEETING SUMMARY

A proforma quality assurance document will be discussed during the Pre-Verification meeting and training undertaken with the management team for non verified areas.

The Pre-Verification meeting will be led by Geoshield and should include all relevant parties who have an impact on the installation and future protection. Geoshield will provide guidance and strategy for all parties.

The site specific checklist will be covered as well as the risk assessment. This site has been classified as a CS2 gas regime rating with basic Radon protection measures.

Any design alterations will be discussed and included in a revised Pre-Verification Plan.

Any specification changes must also be included in a revised Pre-Verification Plan.

All items will be minuted by the Geoshield representative.

This Pre-Verification plan follows all current guidance and the aim is to make all parties aware of the ramifications of poor installation and their responsibilities if they damage the membrane.

