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**RADON GAS
PROTECTION MEASURES
VERIFICATION
IMPLEMENTATION PLAN**

For

RADCLIFFE CIVIC HUB,

RADCLIFFE, MANCHESTER

Prepared for

VINCI BUILDING LTD

On Behalf of

BURY COUNCIL

Report No. 5238-G-R004

Date: August 2024

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APPENDICES

Appendix A – Drawings

Drawing No.	Title
IDG Drawings	
5238-G-D001	Site Location Plan
5238-G-D004 Rev G	Exploratory Hole Location Plan
Third Party Drawings – Floor Plans	
RADHUB-PAL-VV-XX-DR-A-1105 Rev P03	Proposed Site Layout Plan
RADHUB-POZ-V4-ZZ-DR-A-3500	Proposed GA Sections (Sheet 1)
RADHUB-POZ-V4-ZZ-DR-A-3501	Proposed GA Sections (Sheet 2)
RADHUB-POZ-V4-B1-DR-A-2100-C02	Basement Setting Out Plan (1 of 3)
RADHUB-POZ-V4-B1-DR-A-2101-C02	Basement Setting Out Plan (2 of 3)
RADHUB-POZ-V4-B1-DR-A-2102-C01	Basement Setting Out Plan (3 of 3)
RADHUB-POZ-V4-B1-DR-A-2105-C02	Lower Ground Floor Setting Out Plan (1 of 3)
RADHUB-POZ-V4-B1-DR-A-2106-C02	Lower Ground Floor Setting Out Plan (2 of 3)
RADHUB-POZ-V4-B1-DR-A-2107-C02	Lower Ground Floor Setting Out Plan (3 of 3)
RADHUB-POZ-V4-00-DR-2135-C01	Learner and Main Pool Setting Out Plan
Third Party Drawings – Radon Gas Protection Design Details	
RADHUB-PHA-V4-00-DR-Y-0001	Building Perimeter FFL Less than 150mm Above Ground Level
RADHUB-PHA-V4-00-DR-Y-0002	Building Perimeter Curtain Wall Level Threshold
RADHUB-PHA-V4-B1-DR-Y-0003	Clip and Climb Retaining Wall
RADHUB-PHA-V4-B1-DR-Y-0004	Plant and Water storage Retaining Wall
RADHUB-PHA-V4-B1-DR-Y-0005	Lift Pit
RADHUB-PHA-V4-B1-DR-Y-0006	Stair core Retaining Wal
RADHUB-PHA-V4-ZZ-DR-Y-0007	RC Slab Joint
RADHUB-PHA-V4-ZZ-DR-Y-0008	RC Slab Pipe Penetration Cast-in
RADHUB-PHA-V4-ZZ-DR-Y-0009	RC Wall Pipe Penetration Cast-in
RADHUB-PHA-V4-ZZ-DR-Y-0010	Typical Penetration through Cementaid Waterproof Concrete
RADHUB-PHA-V4-ZZ-DR-Y-0011	Typical Service Penetration through Juta Titanbond membrane
TD-JUTA.GPTB.073	Piled Wall Head Sequencing Detail
TD-JUTA.GP1-SAM.017	Cavity Wall Tie - Penetration Detail
TD-JUTA.GP5.043	Pile Cap - Liquid Applied Membrane Above

Appendix B – Gas Measures Product Specification Information

Appendix C – Gas Measures Inspection Proforma Example

Appendix D – Integrity Testing Proforma Example

Appendix E – Radon Report

Revision History

From	Date	Comments
5238-G-R004	9 th August 2024	Original Report

RADON GAS PROTECTION MEASURES

VERIFICATION IMPLEMENTATION PLAN

For

RADCLIFFE CIVIC HUB, RADCLIFFE

1 GENERAL

1.1 The Commission and Brief

- 1.1.1 ID Geoenvironmental Limited (IDG) have been commissioned by Vinci Building Ltd on behalf of Bury Council (The Client) to undertake a Radon Gas Protection Measures Verification Implementation Plan of land at Radcliffe Hub, Radcliffe, hereafter referred to as 'the site'. Vinci Building Limited (Vinci) have been appointed by Bury Council as the Design & Build Contractor for the proposed development.
- 1.1.2 The purpose of this document is to satisfy the requirements of CIRIA C735 (Good Practice on the Testing and Verification of Protection Systems for Buildings against Hazardous Ground Gases) by setting out the verification activities and the integrity testing (if any) appropriate to the site-specific risk assessment, the development itself and design of the site-specific gas protection system.
- 1.1.3 This document also enables the client and potential contractors installing the gas protection measures to gain an appropriate understanding of the level of independent verification inspections and any associated integrity testing required for the development.

1.2 Previous Reports

- 1.2.1 IDG have previously issued the following reports relating to the site:
- Geoenvironmental Appraisal of Land at Radcliffe Civic Hub (Report Ref. 5238-G-R001 Rev B, dated August 2022).
 - Remediation Statement for Land at Radcliffe Civic Hub (Report Ref. 5238-G-R002, dated April 2023).
- 1.2.2 IDG are currently in the process of preparing a Remediation Verification Report for remediation works specified in report ref. 5238-G-R002.

1.3 The Development

- 1.3.1 The proposed redevelopment of the site comprises a three-storey leisure and community centre that will include a lower ground floor level (i.e. basement). The centre is to include a swimming pool, climbing wall, fitness suite, library and community rooms.
- 1.3.2 Drawing No. RADHUB-PAL-VV-XX-DR-A-1105 Rev P03 presented in Appendix A shows the extent of the proposed building with cross sections. Drawing No. RADHUB-POZ-V4-ZZ-DR-A-3500 & RADHUB-POZ-V4-ZZ-DR-A-3501 presented in Appendix A show the proposed floor elevations of the building.

1.4 Proposed Foundations and Floor Construction

- 1.4.1 The Civic Hub building will be constructed with a piled foundation solution.
- 1.4.2 Floor construction will comprise a combination of ring beams with cast in-situ floor slabs.
- 1.4.3 Foundations and floor construction details are shown on drawings presented in Appendix A.

2 THE GROUND GAS REGIME AND THE GAS PROTECTION SYSTEM

2.1 The Ground Gas Regime

- 2.1.1 As outlined in IDG's Geoenvironmental Appraisal (5238-G-R001 Rev B) and Remediation Statement (5238-G-R002), the ground gas regime at the site has been assessed in accordance with the methodologies advocated in current guidance (including but not limited to BS 8576:2013, BS8485:2015, CIRIA C665:2007 and BRE 211:2023).
- 2.1.2 With reference to conceptual model for the site:
- No significant risk from landfill or mines gas has been identified.
 - No significant concentrations of hydrocarbons or Volatile Organic Compounds (VOCs) were identified during the site investigation of the development.
 - A BGS site-specific radon report (December 2022 map) indicates the site lies within an area where between 3-5% of properties are affected by radon.
 - Basic radon protection measures are required in new buildings.
 - On consideration of the type of building to be constructed, employers must ensure the health and safety of employees and others who have access to their work environment. BRE document BR211:2023 states that an assessment of health and safety risks under national HSE regulations should include radon where the workplace is in a radon-affected area, or in any location where there is a basement that is regularly occupied, and both of these scenarios apply to this site. This assessment requires the monitoring of radon in the building post construction.
- 2.1.3 Based upon the factors presented above, the site is within a Radon affected area. Basic Radon Protection Measures are therefore required to be installed in the new Civic Hub building, along with post-construction Radon Monitoring to satisfy requirements of the Local Authority and HSE.
- 2.1.4 A copy of the BGS Radon Report is included in Appendix E.
- 2.1.5 No other hazardous ground gas sources have been identified and therefore gas protection measures do not need to be designed to be protective of gases such as carbon dioxide and methane, or hydrocarbon/ VOC vapour intrusion.

2.2 Basic Radon Protection System

- 2.2.1 BRE 211 (2023) recommends utilising a 400 micrometre virgin polyethylene DPM with a minimum number of sealed penetrations. A well installed and inspected radon membrane will also provide protection against moisture from the ground and satisfy the requirements of both radon protection and damp proofing.
- 2.2.2 British Standard 8485:2015 + A1:2019 states that "a polyethylene membrane material less than 400 microns is unlikely to withstand construction damage post installation. It is generally accepted that the robustness of a gas-resistant membrane is more critical to its performance than its permeation rate*3 to challenge gases, therefore it is advisable to use a membrane of 400 microns or above according to construction conditions identified by the design. The membrane should be:
- Sufficiently strong to withstand in-service stresses (e.g. settlement if placed below a floor slab).
 - Sufficiently strong to withstand the installation process and following trades until covered (e.g. penetration from steel fibres in fibre reinforced concrete, penetration of reinforcement ties, tearing due to working above it, dropping tools, etc.).
 - Capable, after installation, of providing a complete barrier to the entry of relevant gas.

- Verified in accordance with CIRIA C735.

2.3 Typical Foundation/Ground Floor Details

- 2.3.1 Construction design details which illustrate the gas protection details for the new Civic Hub Building are provided on drawings presented in Appendix A.

2.4 Gas Protection Measures – Materials Used

- 2.4.1 The products proposed for use to provide basic Radon gas protection measures at Radcliffe Civic Hub development are summarised in the following table:

Basic Radon Gas Protection Measures	Products Used
Membrane Elements	
Gas Protection Membrane/DPM	Juta GP-TitanFlex Juta GP5 Membrane Juta TitanBond
Concrete Surfaces	Juta GP Liquid Barrier Juta GP Sealant Juta GP CAB Flex
Service Penetrations/ Steel Work Penetrations	Juta GP Liquid Barrier Juta GR-SAM Juta GP Sealant
Corner/ Threshold Detail	Juta GR-SAM Juta GP-TitanFlex Juta GP5 Membrane
Sealing Tape	Juta Titan Tape

- 2.4.2 Product specification information for the materials to be used are presented in Appendix B.
- 2.4.3 IDG have reviewed the specifications of the above products and consider that, subject to correct installation, the above components and materials offer adequate Radon gas protection in accordance with the current guidance.

Change in Gas Protection Products Used

- 2.4.4 Should the gas protection products change throughout the construction programme, details of the different products must be provided to IDG to determine their suitability for use. Only after approval of the proposed gas protection products has been given by IDG may they be used at the development.
- 2.4.5 All of the details regarding any agreed changes to alternative products will be presented in the verification report.

3 THE INSPECTION/INTEGRITY TESTING REGIME

3.1 Requirements and Scope of Inspections and Verification

- 3.1.1 A number of factors should be taken into consideration when determining the scope of inspection and verification. Figure 3.1 in CIRIA C735 illustrates a risk-based approach to determining a scope of inspection and verification which is both appropriate and site specific. This takes into consideration four main factors:

- Gas Regime
- Design Complexity
- Number of plots/ buildings
- Installation workforce (qualified/ skilled/ unskilled)

3.1.2 With regard to the four risk factors noted above IDG have undertaken a qualitative assessment of the risk presented in order to enable an inspection/testing frequency to be derived. This assessment is presented in the following table.

Risk Factor	Relevant Information	Degree of Risk
Gas Regime	Radon only – Basic Radon Protection Required	Low/Medium
Design Complexity	Complex sub-structure design includes piled foundations with associated ring beams set at various levels corresponding to basement and ground-level structures. Multiple separate pours of ring beams and slabs creating need for high level detailing to ensure continuity of gas protection at substructure interfaces and joints, and floor slab interfaces. Use of liquid membrane on concrete surfaces in conjunction with taped connections and seals. Gas membrane and service penetrations to be sealed via tape. Larger areas of membrane to be sealed via heat welding. GR-SAM detailing membrane to be used around penetrations.	High
No. of Blocks	Single large building, albeit with multiple levels due to basement and ground floor design	Medium
Installation Workforce	SEL Environmental Ltd are a specialist installer, with relevant qualifications to NVQ L2 / CSCS Gas Membrane Installer.	Low/Medium

3.1.3 In consideration of the above risk factors, IDG consider the overall risk associated with the gas regime and installation of gas protection measures is medium to high, predominantly as a result of the design complexity.

3.1.4 It is understood that the installers for this development will be SEL Environmental Ltd, a specialist installer with several years of experience of installing gas protection measures. At least one of their operatives holds a relevant qualification for membrane installation to NVQ L2 in Gas Protection Installation.

3.1.5 Should the level of skill/ experience of the installers change, revision to the scope of inspections and integrity testing will be required.

3.2 Inspection Requirements

3.2.1 Based on there being a medium to high risk associated with the quality of installation of the gas protection measures, the requirements for inspection and integrity testing are summarised in the following table:

Element of Gas Protection System	Independent Visual Inspections	Mechanical Point Stress Test	Air-Lance Integrity Test	Provision of Non-Independent information via Installer and Vinci QA Inspection reports
Sub-structure pile caps and ring beams <i>(typically small areas of complex design incorporating GR Liquid barrier, joined to Titan Flex/ GP5 membranes using Taped joints)</i>	Yes	Yes (where appropriate)	Not generally possible due to limited access, presence of steelwork etc	Yes
Floor slab areas <i>(typically incorporating larger areas of GP5/ Titan flex membrane, with heat-welded/ taped joints being sealed to lapped membrane from sub-structure)</i>	Yes	Not required due to air-lance integrity testing	Yes	Yes
Remedial Actions	At discretion of Independent Verifier subject to complexity and nature of remedial action			Yes

3.3 Independence and Competency of Inspector

Independence

- 3.3.1 In accordance with C735 Section 3.3.2, conflicts of interest in verification should be avoided. A contractor or gas membrane supplier certifying their work or product is considered to be a conflict of interest and is not good practice. Verification should normally be carried out by an organisation independent of the gas membrane installation contractor or the developer/main contractor.
- 3.3.2 IDG are not, and are not affiliated with, a manufacturer or installer of gas protection measures, and as such are therefore appointed by Bury Council/ Vinci Building Ltd as an independent verification consultant.

Competency

- 3.3.3 IDG's Verification Engineers have the following training and experience with regard to validation of gas protection measures:
- An up-to-date working knowledge and understanding of current standards and guidance surrounding the assessment of hazardous ground gas, and the design, application, installation and verification of gas protection measure. This includes but is not limited to the following documents in the table below:

Document Reference	Guidance Document Title
CIRIA C665 - 2007	Assessing risks posed by hazardous ground gases to buildings.
CIRIA 716 - 2012	Remediating and mitigating risks from volatile organic compound (VOC) vapours from land affected by contamination.
CIRIA C735	Good practice on the testing and verification of protection systems for buildings against hazardous ground gases.
BS 8576:2013	Guidance on investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs).
BS8485:2015	Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings.
BRE Report BR 211 2023	Guidance on protective measures for new buildings (including supplementary advice for extensions, conversions and refurbishment projects)
BRE Report BRE414	Protective measures for housing on gas-contaminated land
ASTM D4437	Standard Practice for Non-destructive Testing (NDT) for Determining the Integrity of Seams Used in Joining Flexible Polymeric Sheet Geomembranes.

- Have attending the following training courses relevant to the verification of gas protection measures:

Course Provider	Course and Key Aspects
PAG / GGS	A to Z of Ground Gas: - Introduction to Hazardous Ground Gas, Data Collection, Risk Assessment, Principles and Case Studies, Design and Practices of Gas Protection, Radon, The Verification Process, Verification in practice.
CIRIA	Verification of Gas Membranes: A 2016 Update

- Hold at least a senior engineers position, with at least 10 years experience in the contaminated land industry, specifically with previous experience of Site Investigation, Hazardous Ground Gas Assessment, Validation of Remediation Works and Validation of Gas Protection Measures.

4 VISUAL INSPECTION/INTEGRITY TESTING PROCEDURE

4.1 Independent Visual Inspection Requirements

- 4.1.1 The visual inspections will require a suitably qualified engineer to visit the site to inspect the installation of ground gas protection measures.
- 4.1.2 The visit should be instructed by the installer via the site manager or project manager at the earliest opportunity following completion of each element/ area of the gas protection measures.
- 4.1.3 In order to properly inspect the membrane, the inspection must occur before placement of any obstructions such as insulation, reinforcement, sand blinding etc. to allow a thorough and unobstructed inspection of the entire membrane and associated gas protection products.
- 4.1.4 The verification inspection will include the following aspects:
- Gas Proof membrane to be suitable for application and conforming to specification (i.e. Gas resistant/ VOC resistant/ radon protective where required)
 - No punctures in membrane surface due to poorly prepared surface beneath
 - Adequate lapping of membrane joints
 - Adequate sealing of membrane penetrations and joints
 - Any sealing tape (double sided/ lapping) to be suitable for application and conforming to specification.
 - Overall continuity of gas protection system

4.2 Method of Recording and Reporting Inspections

- 4.2.1 In order to formally record and report the verification visit, the engineer will work through a number of elements (as above), with notes and comments recorded on a standard proforma on site. This will then be written up in a digital format upon return to the office.
- 4.2.2 A example of the proforma to be used is included in Appendix C for reference.
- 4.2.3 Following each inspection, the engineer will report back to the site manager / project manager on site, with recommendations made for any required remedial actions and to confirm whether inspected areas/ elements of the gas protection system have passed, allowing work and concrete pours to progress.
- 4.2.4 IDG will issue a digital copy of the completed proforma to the project manager for the site/

progress record. IDG will retain digital copies of the information for inclusion in the verification report that shall be issued after the last inspection and integrity test has occurred at the development.

4.3 Integrity Testing Scope and Methodology

4.3.1 Following review of all available guidance, and with consideration of the CSM, and design details, IDG have determined that the most appropriate methods of integrity testing to use for the development are a combination of mechanical point stress tests and air lance testing of membrane seams and joins.

4.3.2 Whilst air lance testing is the preferable method, in accordance with the CIRIA 735 guidance, Mechanical Point Stressing is more appropriate in hard-to-reach areas where it is not possible to air lance. IDG consider that the complexity of the substructure design is likely to result in a number of areas where air lance testing is not possible/ practical. Such areas are therefore more suited to mechanical point stress testing.

4.3.3 Mechanical Point Stressing is to be undertaken in accordance with relevant guidance document ASTM D4437-08:2013, (Standard Practice for Non-destructive Testing for Determining the Integrity of Seams Used in Joining Flexible Polymeric Sheet Geomembranes) utilising the following methodology:

'This test method shall be used as a qualitative measure of edge bonding. A blunt instrument (for example, a screwdriver) shall be run along the edge of the seam to find obvious unbonded areas. The procedure shall not puncture or otherwise damage the sheet material. Perform point stressing only after the seam has had sufficient time to cure in accordance with manufacturer's directions.'

4.3.4 Air Lance Testing is to be undertaken in accordance with relevant guidance document ASTM D4437-08:2013, (Standard Practice for Non-destructive Testing for Determining the Integrity of Seams Used in Joining Flexible Polymeric Sheet Geomembranes) utilising the following methodology:

'Inspect all seams for unbonded areas using an air nozzle directed on the upper seam edge and surface to detect loose edges, ripples indicating unbonded areas within the seam, or other undesirable seam conditions. Check all bonded seams using a minimum 50 psi (345 kPa) (gage) air supply directed through a 3/16 in. (4.8 mm) (typical) nozzle, held not more than 2 in. (51 mm) from the seam edge and directed at the seam edge'.

4.3.5 IDG have the required specialist equipment, conforming to the requirements of ASTM D4437-08:2013, to enable a competent engineer to complete the air lance integrity testing in accordance with the requirements of CIRIA C735.

4.4 Elements of Gas Protection Requiring Integrity Testing

4.4.1 IDG consider the element of gas membrane installation most commonly found to be unsatisfactory is where individual sheets of membrane are joined together, or where service penetrations and tophats have been bonded to the gas membrane. Creases, dampness, and poor workmanship often lead to poorly sealed joins, which results in a significant loss of continuity and therefore integrity across the gas membrane system as a whole.

4.4.2 IDG consider that mechanical point stressing and air lance testing will allow such weaknesses in the membrane installation to be highlighted quickly and transparently, enabling IDG to advise the installer of the need for any remedial work at the time of inspection.

4.4.3 The testing will therefore focus on:

- Integrity of joins/ seams and bonding between the gas membrane and DPM/ waterproofing elements
- Integrity testing of joins/ seams and bonding between Liquid Barrier and gas membrane sheets
- Integrity of joins/ seams and bonding between individual gas membrane sheets
- Integrity of joint/ seams and bonding between any additional potential discontinuities, including service penetrations (top hats), internal wall structures, around doorways etc.

4.5 Performance Requirements of Air Lance Integrity Testing

- 4.5.1 The air lance testing will highlight any areas where the joins or seams are inadequately bonded by an apparent riffling of the membrane on the opposite site of the join as the air flow passes through the join and sealing tape. Where seams are very poorly bonded, the air lance is likely to visibly open the join.
- 4.5.2 Any locations where this occurs are considered to be an integrity failure and should be recorded on the proforma.
- 4.5.3 Upon completion of the testing, the engineer should walk around each block with the site manager and/ or installers, with each failure point highlighted and discussed, and remedial repair requirements instructed as necessary.
- 4.5.4 Following completion of any remedial repair works, the joins and seams should be re-tested using the same air lance methodology to ascertain that any remedial works have been successful and no further failures occur.
- 4.5.5 Areas of the gas protection should not be certified until the integrity testing has demonstrated sufficient conformity to the requirements for fully bonded joins and seams, thus ensuring continuity of the gas membrane protection.

4.6 Method of Recording and Reporting Integrity Testing

- 4.6.1 In order to formally record and report the integrity testing, the engineer will complete an integrity testing proforma recording relevant diagrams, notes and comments on site. This will then be written up in a digital format upon return to the office.
- 4.6.2 An example of the proforma to be used is presented in Appendix D for reference.
- 4.6.3 Following each integrity testing visit, the engineer will report back to the site manager / project manager on site, with recommendations made for any required remedial actions and to confirm whether areas of the gas protection measures have passed, allowing work to progress.
- 4.6.4 IDG will issue a digital copy of the completed proforma to the project manager for the site progress record. IDG will retain digital copies of the information for inclusion in the verification report.

4.7 On-going Duty of Care and Verification

- 4.7.1 Notwithstanding the outcome of the inspections and integrity testing as detailed above, IDG understand that whilst the verification inspection and testing are applicable and robust at the time of reporting, there remains the potential for the integrity of the installed gas protection

measures to be compromised post-verification.

- 4.7.2 Compromise to the effectiveness of the installed gas measures can occur as a result of bad practice and lack of awareness of the significance of the gas protection measures. For example, puncturing of the membrane during placement of steel reinforcement, stressing/ tearing of the membrane by excessive footfall or trafficking, damage by follow-on trades including damage to membrane or blocking up ventilation air bricks etc.
- 4.7.3 Site staff and contractors have a duty of care to minimise post-verification damage to gas protection measures. Where such occurrences take place after independent or non-independent verification has occurred, both IDG and site staff have a duty of care to ensure that any damage is identified, reported and appropriate remediation is completed.
- 4.7.4 Should the engineer observe unacceptable practices or damage occurring on plots during later site visits or be provided with information from other parties that indicate the integrity of the gas protection measures has been compromised by follow on construction activities, IDG withhold the right to revoke a previous validation.

4.8 Non-Independent QA Inspections

- 4.8.1 Whilst IDG are to provide independent inspections and testing of the installed radon gas protection measures as outlined in the preceding sections of this document, The Design & Build Contractor (Vinci) will carry out their own QA inspections and produce bespoke QA records for the radon protection measures.
- 4.8.2 In addition, QA records completed by the installers (SEL Environmental Ltd) will be incorporated into the Vinci QA records.
- 4.8.3 QA Records prepared by the installers and design/build contractor are considered to be 'non-independent' (i.e. there is a conflict of interests that would typically deem the information unsuitable for standalone verification purposes).
- 4.8.4 For this project non-independent information will be largely supplementary to IDG's independent verification, and will serve to provide additional information, records and confidence throughout the installation.
- 4.8.5 The non-independent QA records should include details of the products, key aspects, and photographic records that demonstrate appropriate installation of the gas protection measures.
- 4.8.6 In certain circumstances, at the discretion of the IDG verification engineer, (and subject to the design complexity of a given element of the gas protection, and confidence in the quality of work), it may be considered appropriate that small simple sections of the gas protection installation or minor remedial works can be documented via non-independent verification.
- 4.8.7 All non-independent QA information should be issued to IDG in a timely manner and suitable digital format for review and approval before any further work is undertaken, to allow remedial works to be conducted should IDG's engineer have concerns or not be satisfied with the information provided.
- 4.8.8 Following satisfactory review, IDG will notify the site manager that the installed measures are deemed to be acceptable, and that follow on work (screeding/ concrete pours etc) can progress.
- 4.8.9 The non-independent QA information will be presented in the final gas protection measures verification report on completion of the works to supplement IDG's independent verification.

5 VERIFICATION

5.1 Verification Report

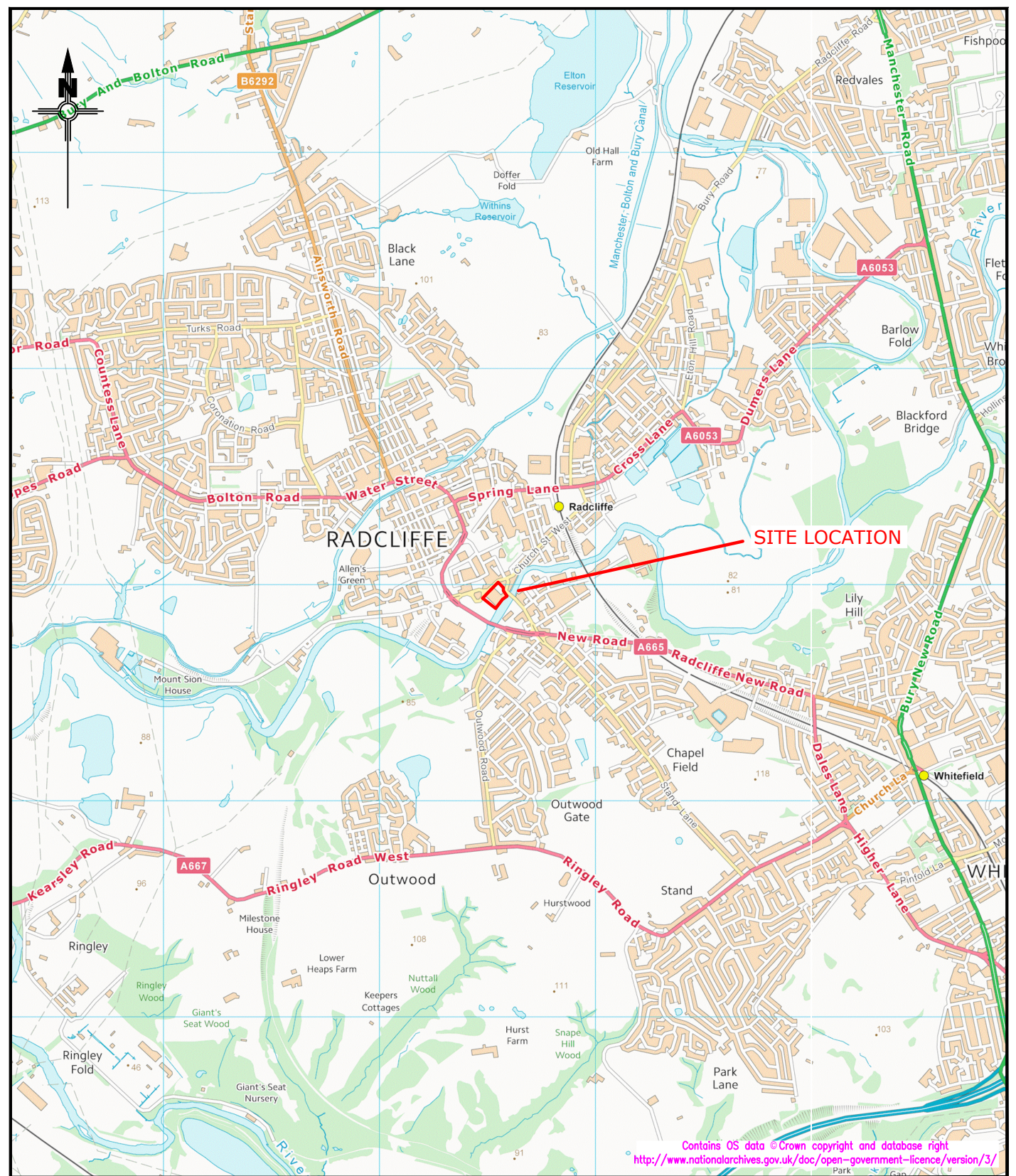
- 5.1.1 All above works should be documented by means of a verification report, however IDG consider it is neither practicable nor cost effective to produce individual verification reports for individual areas/ aspects of the gas protection measures.
- 5.1.2 Therefore, and as advocated in CIRIA C735, IDG propose that areas should be subject to individual certification initially by means of the completed inspection/ integrity testing proforma that will be issued to the Client and the relevant regulator.
- 5.1.3 Upon completion of the works, a final comprehensive Gas Protection Measures Verification Report will be produced, with reference made to completed proforma, which will be included as an Appendix in the verification report.

6 POST-CONSTRUCTION RADON MONITORING

6.1 Radon Monitoring Requirements

- 6.1.1 On consideration of the type of building to be constructed, employers must ensure the health and safety of employees and others who have access to their work environment and BRE document BR211:2023 notes that an assessment of health and safety risks under national HSE regulations should include radon where the workplace is in a radon-affected area, or in any location where there is a basement that is regularly occupied, with both of these scenarios applying to the site. This assessment requires the monitoring of radon in the building post construction.
- 6.1.2 Post-construction radon monitoring is outside of IDG's scope of works and expertise, and therefore will not be documented within IDG's Radon Protection Verification Report.
- 6.1.3 It is therefore recommended that consultation with a third-party specialist is undertaken at the earliest opportunity, to ensure that post-construction radon monitoring is appropriate to the proposed end-use environment and undertaken and reported in a timely manner by an appropriately qualified specialist in accordance with current relevant guidance.
- 6.1.4 Copies of the post-construction radon monitoring data and any associated reports should be issued to the Local Authority EHO for completeness.

Appendix A

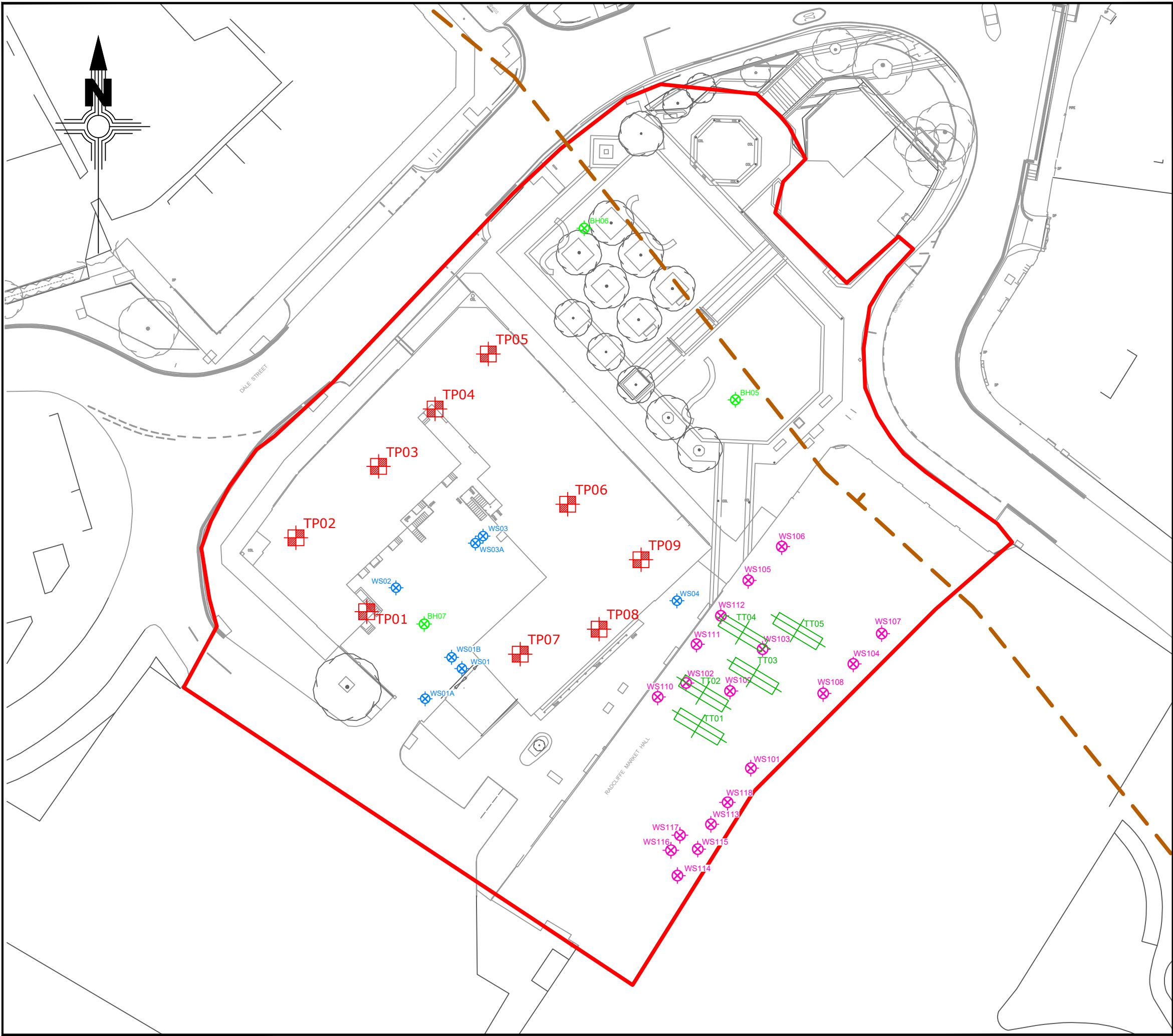


iD GeoEnvironmental Limited

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CLIENT	BURY COUNCIL		
JOB TITLE	RADCLIFFE HUB		
DRAWING TITLE	SITE LOCATION PLAN		

DRAWN BY MJ	SIGNATURE	DATE 26/11/21	STATUS	
APPROVED BRB	SIGNATURE	DATE 26/11/21	SCALE 1:25,000@A4	DRG No. 5238-G-D001



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KEY	
	Site Boundary
	IDG Trial Pit Location (Post-Demo - Jan 2024)
	IDG Window Sample Location 2022
	IDG Rotary Borehole Location 2022
	IDG Window Sample Location April-May 2024
	Vinci Trial Trench Location April 2024
	Approximate Location of Inferred Geological Fault
	Historical Site Feature - 1848 OS Plan
	Historical Site Feature - 1893 OS Plan

Revision	Description	Date
----------	-------------	------

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Caledonian House,
Tatton Street, Knutsford,
Cheshire, WA16 6AG

email: info@id-geo.co.uk

Tel: 01565 755557
Fax: 01565 740263

iD GeoEnvironmental Limited

CLIENT

BURY COUNCIL

JOB TITLE

RADCLIFFE HUB

DRAWING TITLE

EXPLORATORY HOLE LOCATION PLAN

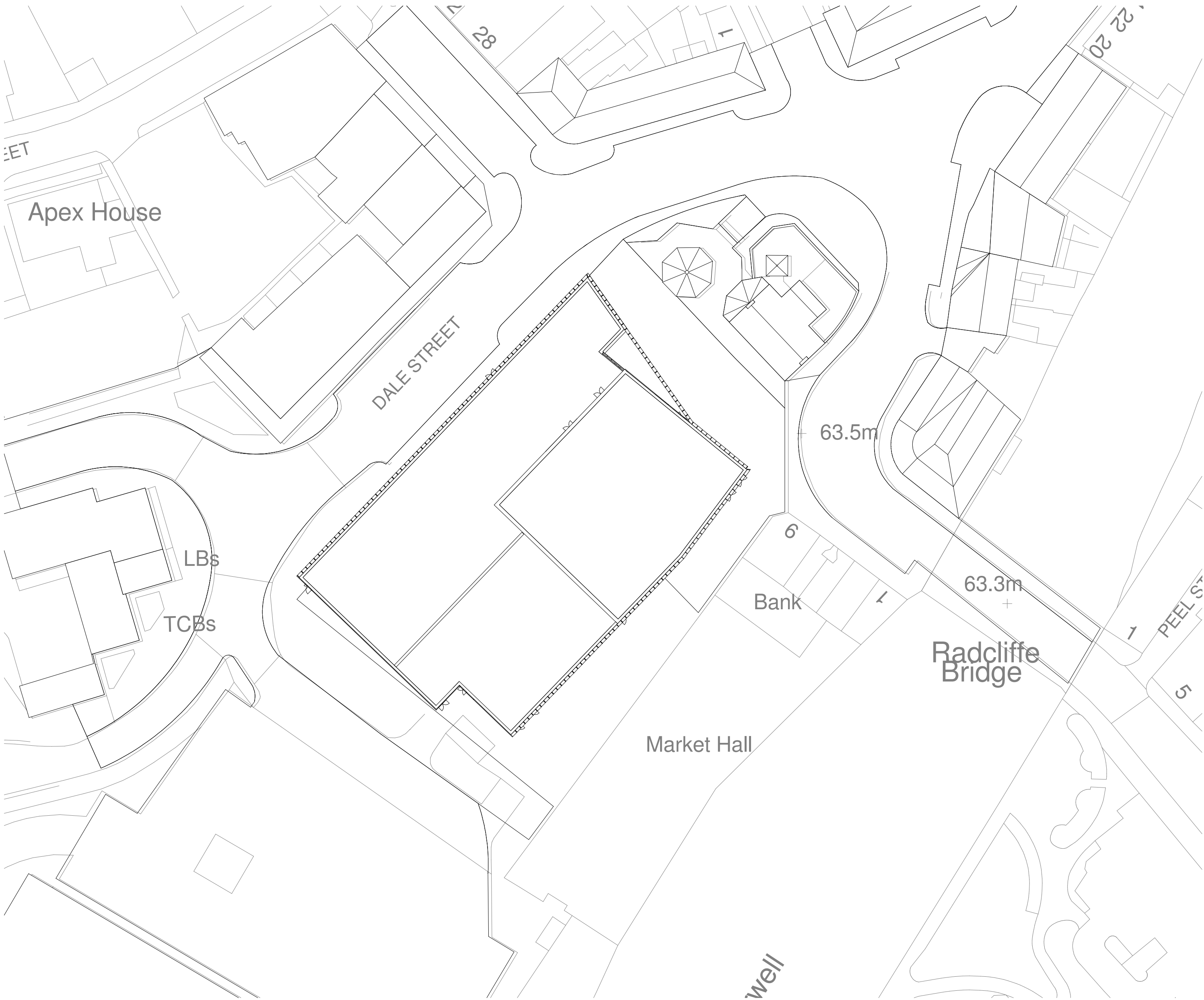
STATUS

FINAL

DRAWN BY	SIGNATURE	DATE
LM		28-05-24

APPROVED	SIGNATURE	DATE
BRB		28-05-24

SCALE	DRG No.
1:500@A3	5238-G-D004-RevG



Notes

The Contractor is to check all dimensions and conditions on site before commencing. Do not scale from this drawing.
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Scale Bars		TO BE USED ONLY AS GUIDANCE			
1:100	mm		1000		3000
1:200	mm		5000		8000
1:500	M		5		15
1:1250	M		10		30

KEYPLAN

P3	Updated to suit elevation changes.	DAS	21.04.22
P2	Updated following client comment. Building footprint updated + Stair 1 updated.	DAS	07.04.22
P1	Updated to suit client comment. Building repositioned on site.	DAS	19.01.22

Rev	Description	By	Date
-----	-------------	----	------

Client VINCI Construction UK Ltd

Job Radcliffe Hub

Drawing Proposed Site Layout Plan

Project Ref. P5860_1105 Rev P3

Issue RADHUB-PAL-VV-XX-DR-A-1105

Date	01/19/22	Scale	1 : 500	@ A2
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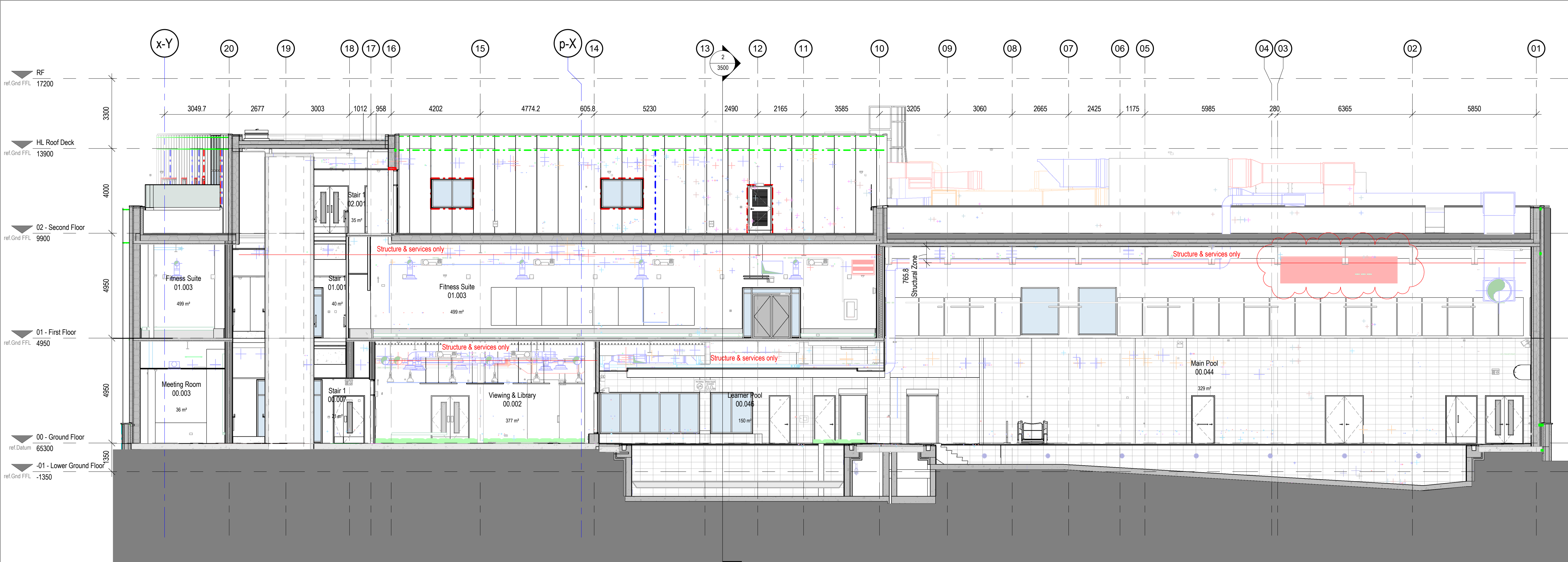
3D CoOrd	DM	2D CoOrd	DAS	Approved	DAS
----------	----	----------	-----	----------	-----

Project Status	Planning	Tender	Construction
	Design	Contract	As Built

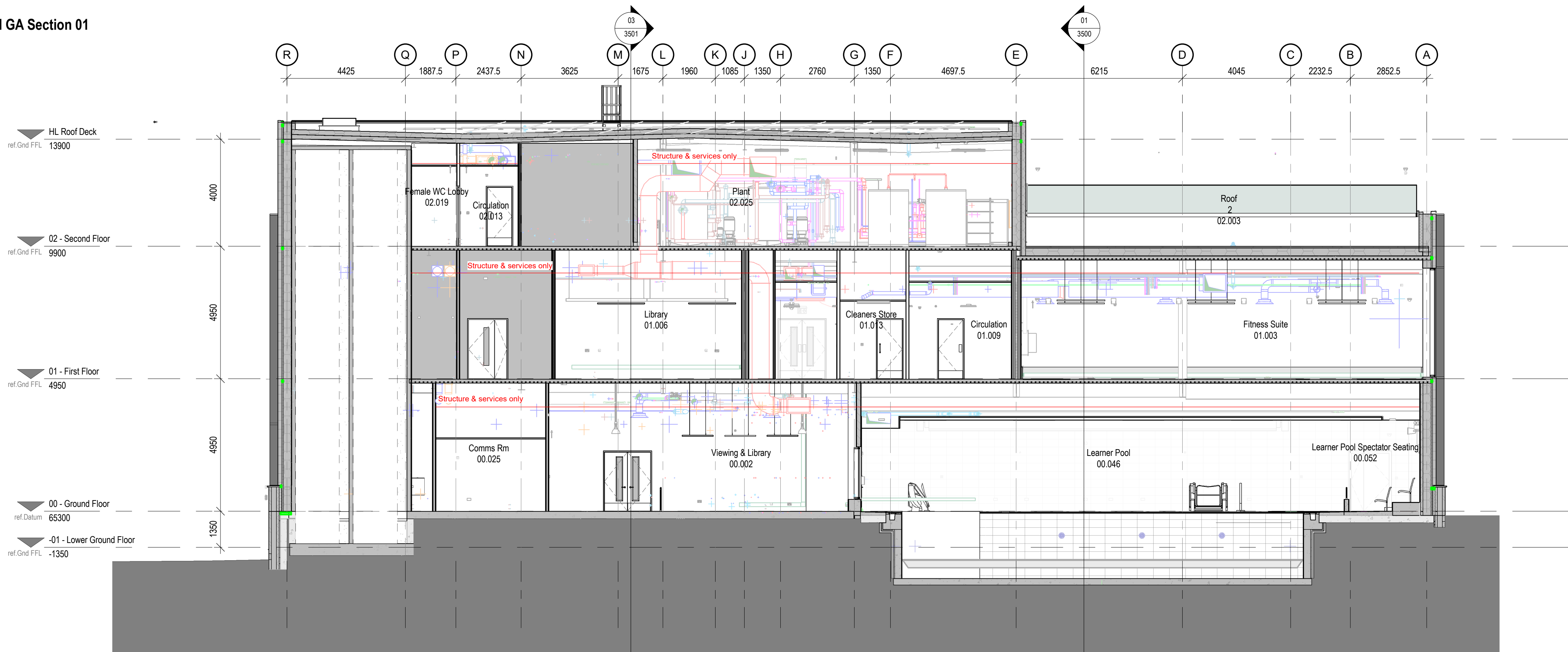
pozzoni

10-12 Emerald Street London WC1N 3QA	Woodville House 2 Woodville Road Altrincham WA14 2FH
--	---

+44 20 7078 0079 architects@pozzoni.co.uk	+44 161 928 7848 www.pozzoni.co.uk
--	---------------------------------------



01 Overall GA Section 01
1 : 100



2 Overall GA Section 2
1 : 100

Notes

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Scale Bars TO BE USED ONLY AS GUIDANCE

1:100	mm	1000	2000	3000	4000	5000
1:200	mm	1000	2000	3000	4000	5000
1:500	m	10	20	30	40	50
1:1250	m	10	20	30	40	50

KEYPLAN

Note: Steels within Main Pool are Pitched - The dashed SRS zone depends on where the section is cut.

All Structure to Structural Engineers Design Details & Specification.

All Services to MEP Consultants Design Details & Specification.

C01	Issued for Construction following comments on Viewpoint	MBR	01.12.23
P01	Stage 4 Issue - First Issue	AH	25.05.23
Rev	Description	By	Date
Client	VINCI Construction UK Ltd		
Job	Radcliffe Hub		
Drawing	Proposed GA Sections (Sheet 1)		
Ref	P5860 3500	Rev	C01
Ref	RADHUB-POZ-V4-ZZ-DR-A-3500		
Date	01/12/2023	Scale	1 : 100
DM	JLG	S4	
Planning	Tender	Construction	
Design	Contract	Construction Record	

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architects@pozzoni.co.uk

Current drawings incorporate the following Revit models: AJP revision P12: Hannan revision P09. Further review and coordination required on receipt of updated Structural and MEP model information, in addition to information from specialist consultants (Pool Plant, Pre-cast Stairs / Lift Shafts, etc.)

Notes

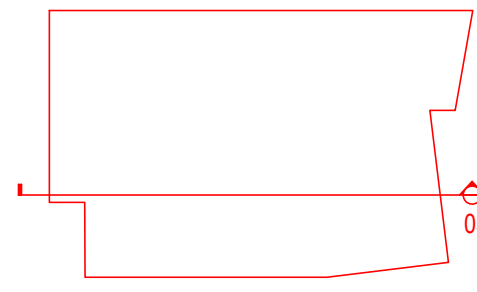
The Contractor is to check all dimensions and conditions on site before commencing. Do not scale from this drawing.
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Scale Bars

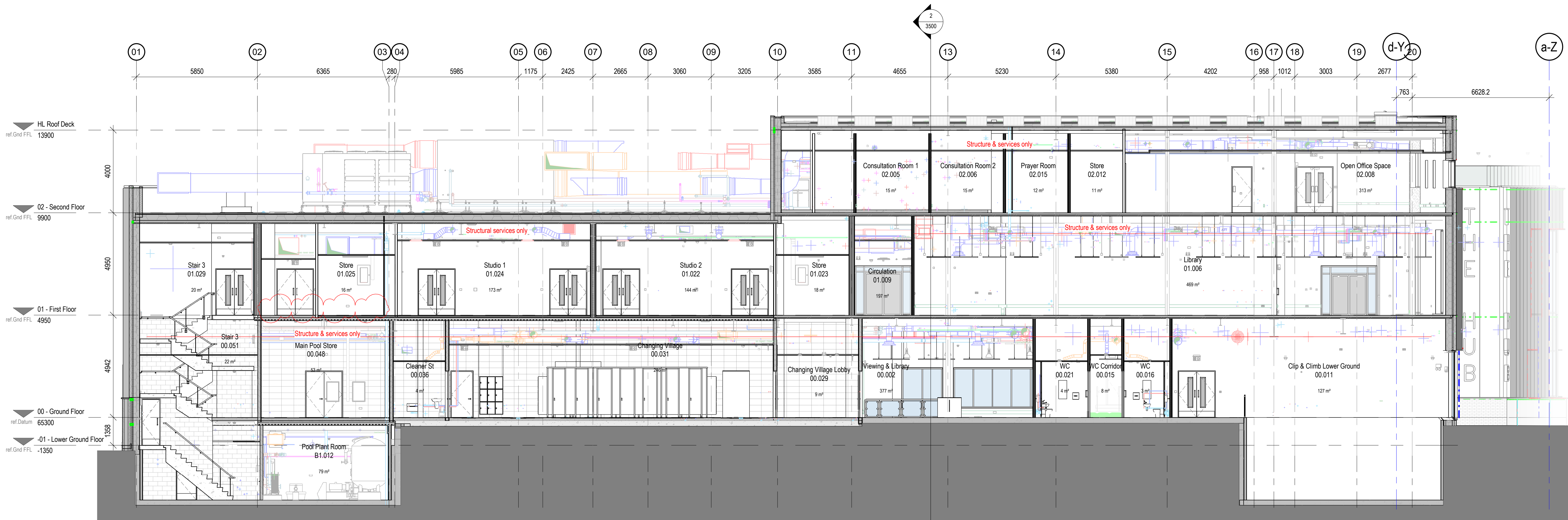
TO BE USED ONLY AS GUIDANCE

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1:200	mm	0	1000	2000	3000
1:500	m	0	10	20	30
1:1250	m	0	10	20	30

KEYPLAN



All Structure to Structural Engineers Design Details & Specification.
All Services to MEP Consultants Design Details & Specification.



03 Overall GA Section 03
1:100

Current drawings incorporate the following Revit models: AJP revision P12: Hanan revision P09. Further review and coordination required on receipt of updated Structural and MEP model information, in addition to information from specialist consultants (Pool Plant, Pre-cast Stairs / Lift Shafts, etc.)

C01	Issued for Construction following comments on Viewpoint	MBR	01.12.23
P01	Stage 4 Issue - First Issue	AH	25.05.23
Rev	Description	By	Date
Client	VINCI Construction UK Ltd		
Job	Radcliffe Hub		
Drawing	Proposed GA Sections (Sheet 2)		
Ref	P5860 3501	Rev	C01
Date	RADHUB-POZ-V4-ZZ-DR-A-3501		
Date	01/12/2023	Scale	1 : 100
DM	JLG	S4	
Planning	Tender	Construction	
Design	Contract	Construction Record	

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architects@pozzoni.co.uk

Dimension Key:

Grid Dimensions	
Movement Joints	
Wall Dimensions	
Wall Openings from Grids	
Internal Dimensions to face of Structure	

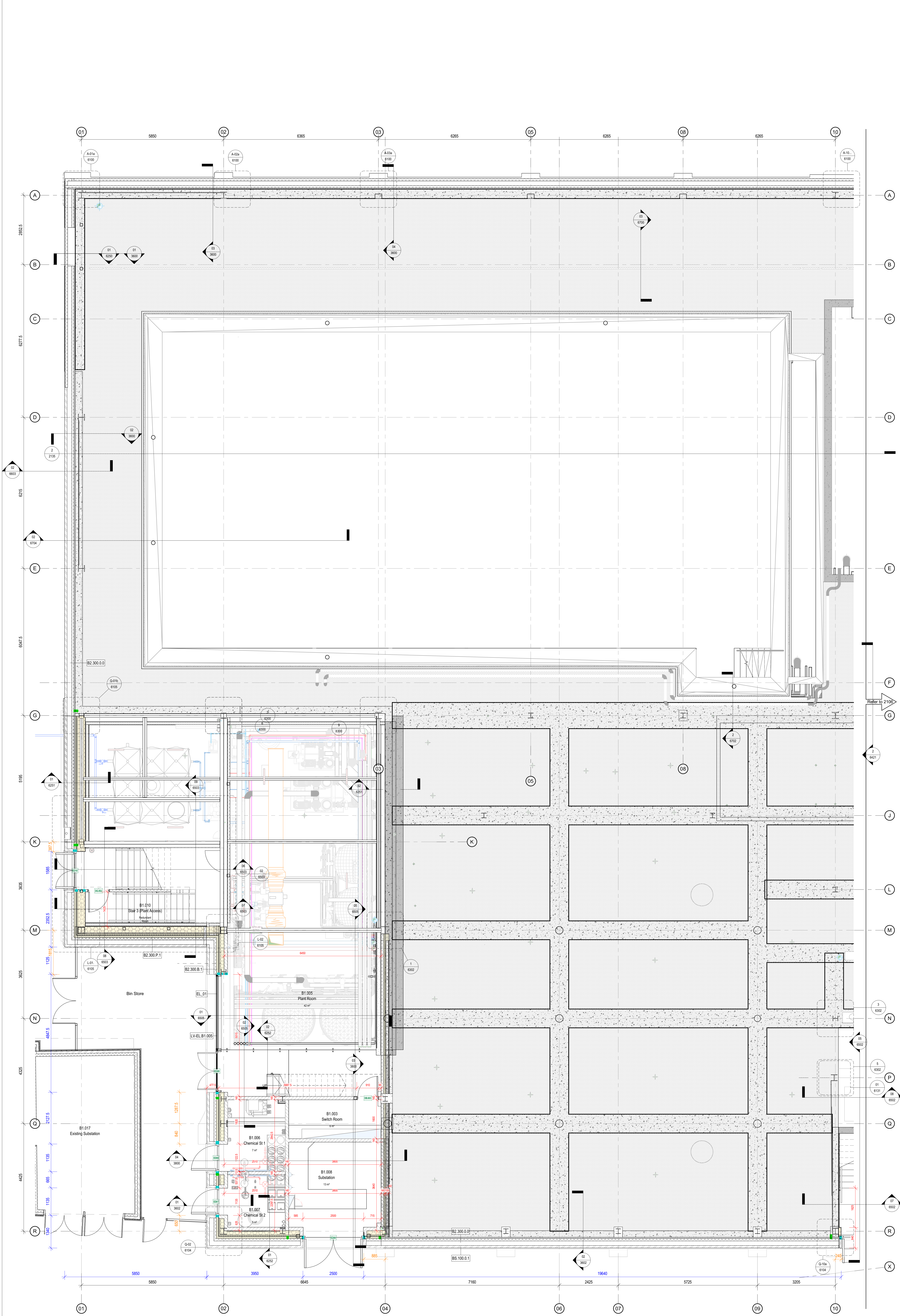


- Architect to interpret the above & develop a strategy (with contractor) for protection (paint or boarding). Moving forward, this will include detailing method of fire protection. This will likely require input from the EE, across

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Setting Out - -01 Lower Ground Floor - 1 of 3
1:50

Notes

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Scale Bars TO BE USED ONLY AS GUIDANCE

1:10	mm	1:10	mm	1:10	mm	1:10	mm
1:10	mm	1:10	mm	1:10	mm	1:10	mm
1:10	mm	1:10	mm	1:10	mm	1:10	mm
1:10	mm	1:10	mm	1:10	mm	1:10	mm

Dimension Key:

- Grid Dimensions
- Movement Joints
- Wall Dimensions
- Wall Openings from Grids
- Internal Dimensions to face of Structure

C02	Amended to correspond with sub-contractors updates	MBR	10.07.24
C01	Issued for Construction	MBR	02.02.24
P04	Stage 4 Submission	AH	26.05.23
P03	Stage 3 update	JAW	27.01.23
P02	Stage 3 Issue	JAW	21.10.22
P01	First Issue	JAW	09.09.22
Rev	Description	By	Date
01	Setting Out Plan - 01 Lower Ground Floor (1 of 3)	JAW	09.09.22

Client: VINCI Construction UK Ltd

Site: Radcliffe Hub

Setting Out Plan - 01 Lower Ground Floor (1 of 3)

P5860_2105 **C02**

RADHUB-POZ-V4-B1-DR-A-2105

Date	08/09/22	Scale	1:50	Sheet	A0
Author	WO	Designer	JLG	Checker	S5
Planner		Tender		Construction	
Design		Contract		Record	

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Lift Shaft design shall be reviewed and optimised at Stage 3 following confirmation of contractor's Lift Supplier, Lift and shaft design to specialist's details with current provisional specification as set out below:

- ICHS Needs/Spec 705 CM - Door Type: Centre Opening
- Complementary Standard: EN81-70 (Accessibility)
- 600kg/13 persons
- Speed: 1.0m/s
- Car Height: 2100mm - Door Height: 2000mm - Door Width: 1100mm
- Entrance Type: Frame - Lift Type: Mounted on Door Frame
- Design Series: Coreless Lift - Design Style: Split Shaft (1303)

Structural steelwork to be fire protected, responsibilities as set out below:

- Fire engineer to set out the fire protection principles required: generally what increases protection & to what extent (including boundary conditions)
- Structural engineer to advise which elements of the structure apply to the fire principles
- Architect to interpret the above & develop a strategy with contractor for the protection (paint or boarding). Moving forward, this will include detailing the method of fire protection. This will likely require input from the FE, architect & specialist applicator

In the event that no specialist advice is given regarding the extents of protection, Contractor must implement fire protection to ALL steelwork.

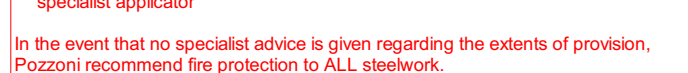
Cavity fire barriers positions & specification to be reviewed by Fire Consultant.

Current drawings incorporate the following Revit models:

- AUP revision: P24 - Revision: Revision: P16 - Further review and coordination required on receipt of updated Structural and MEP model information. In addition to information from specialist consultants (Pool Plant, Pre-cast Stairs / Lift Shafts, etc.)

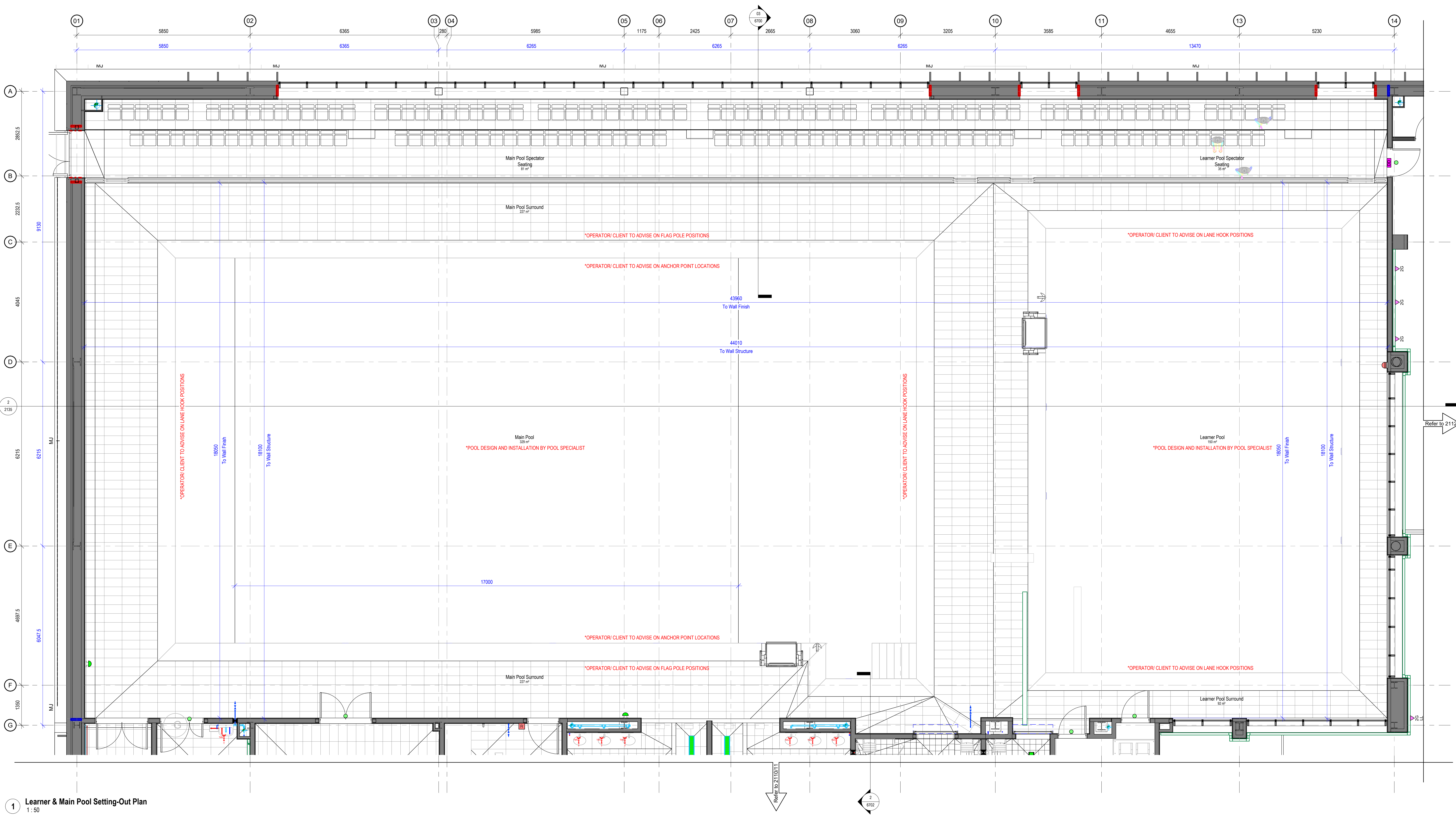
Dimension Key:

Grid Dimensions	
Movement Joints	
Wall Dimensions	
Wall Openings from Grids	
Internal Dimensions to face of Structure	

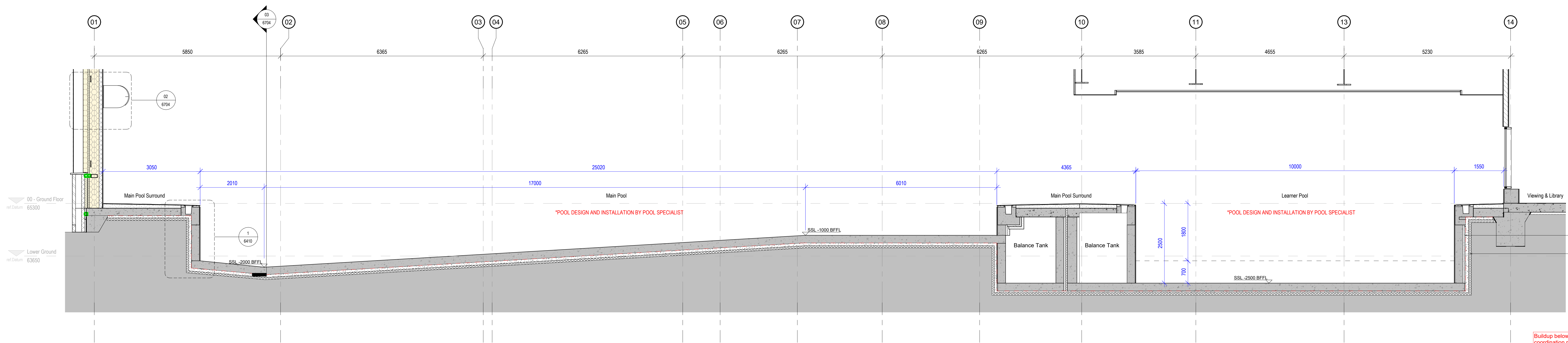


Part No	P5860_2106		Rev	C02
Part Name	RADHUB-POZ-V4-B1-DR-A-2106			
Date	09/09/22	Scale	1 : 50	@ A0
Job Code	WO	Approved	JLG	STATUS S5
Project Status	Planning	Tender	Construction	
	Design	Contract	Construction Reopen	

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architects@pozzoni.co.uk



1 Learner & Main Pool Setting-Out Plan
1:50



2 Learner & Main Pool Setting-Out Plan
1:50

Notes

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Scale	As Shown	As Shown	As Shown	As Shown
1:50	mm	mm	mm	mm
1:100	mm	mm	mm	mm
1:200	mm	mm	mm	mm

Revisions

Rev	Description	By	Date
C01	Issued for Construction	JLG	02.02.24
P05	Stage 4 Issue - Balance tank to main pool moved. Indicative insulation below pool build-up.	AH	25.05.23
P04	Stage 3 Issue. Drawing renumbered from 2115.	JAW	21.10.22
P03	Learner Pool updated	RJF	04.08.22
P02	Section added	DAS	22.07.22
P01	Initial Issue	RJF	21.07.22

Client
VINCI Construction UK Ltd

Location
Radcliffe Hub

Setting Out Plan - Learner & Main Pool

P5860 2135 **C01**

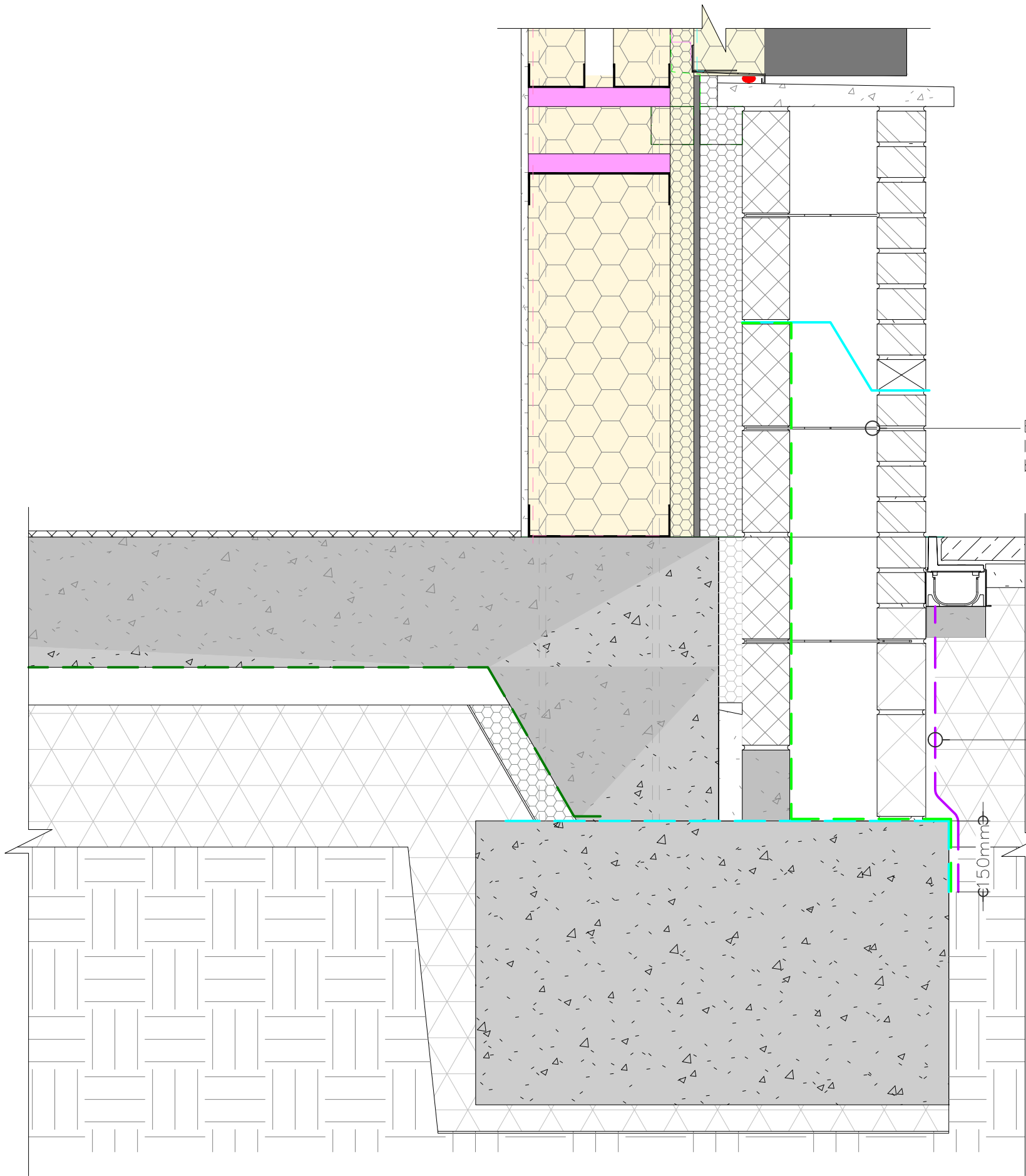
RADHUB-POZ-V4-00-DR-A-2135

21/07/22	US	1:50	@ A0
DM	JLG	S4	
Planning	Tender	Construction	
Design	Contract	Record	

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C:\Users\jlg\Documents\RADHUB\POZ-V4-00-DR-A-2135 - jlg.prt\DWG\000000001.dwg
02/02/24 09:26:14



KEY

GP1 SAM

GP5 DPM + Fleece

GP Liquid Barrier

PD1700

Brick-ties to be detailed locally as per manufacturers best practice guidance.

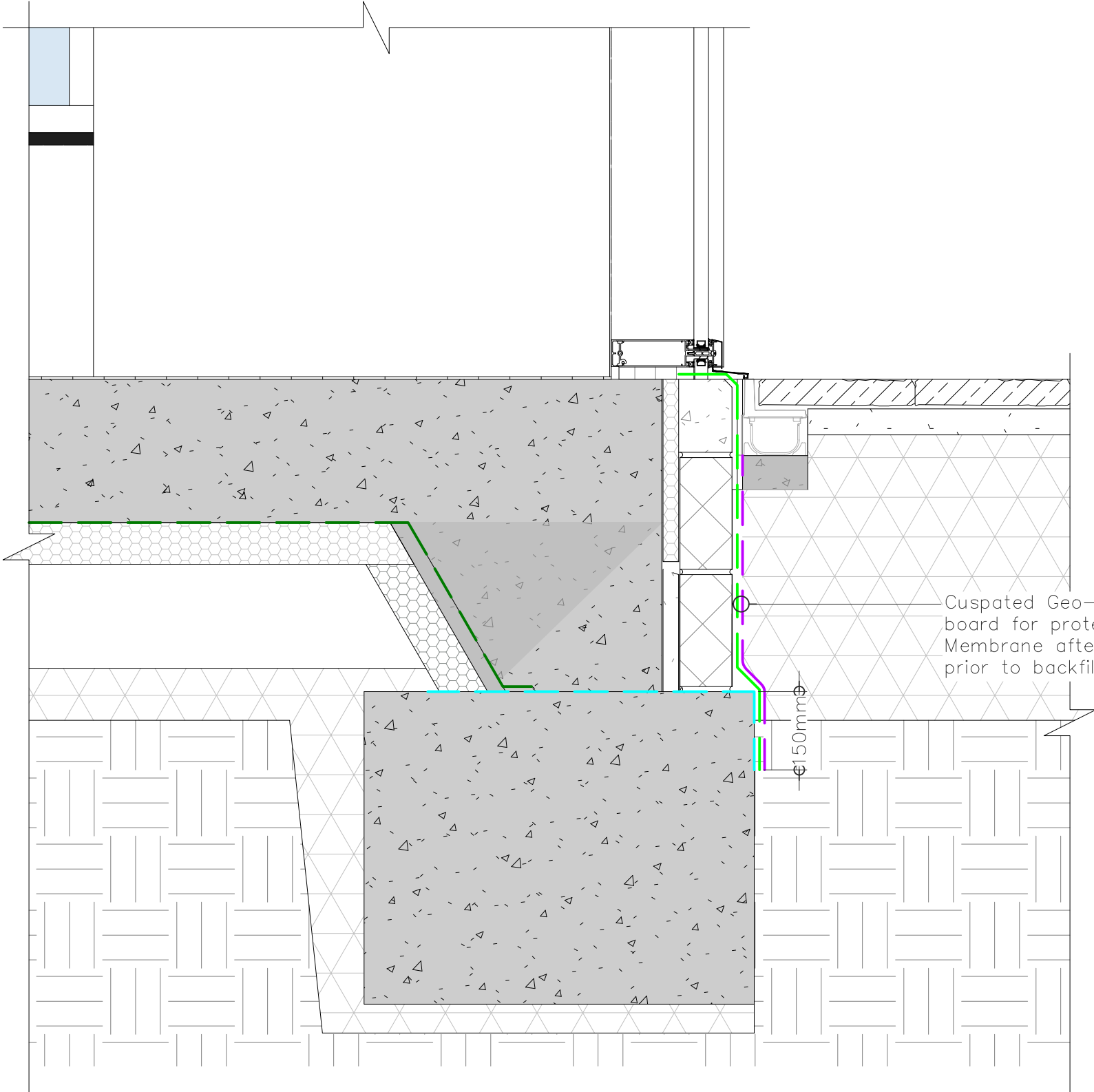
Cuspated Geo-textile drainage board for protection of Type A Membrane after installation and prior to backfill.

Rev C02	24/05/24	ME
Supplier change		
Rev C01	21/02/24	ME
Construction stage issue		
Rev P02	23/09/23	LD
DRG updated in-line with VINCI Project Naming Convention		
Rev P01	13/09/23	LD
First Issue		



PROJECT
Radcliffe
CLIENT
AJP
DRAWING TITLE
Building Perimeter FFL Less than 150mm Above Ground Le
DRAWING NUMBER
RADHUB-PHA-V4-00-DR-Y-0001
REVISION
C02
STATUS
CONSTRUCTION
SCALE
1:10 on A3

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0208 087 3032



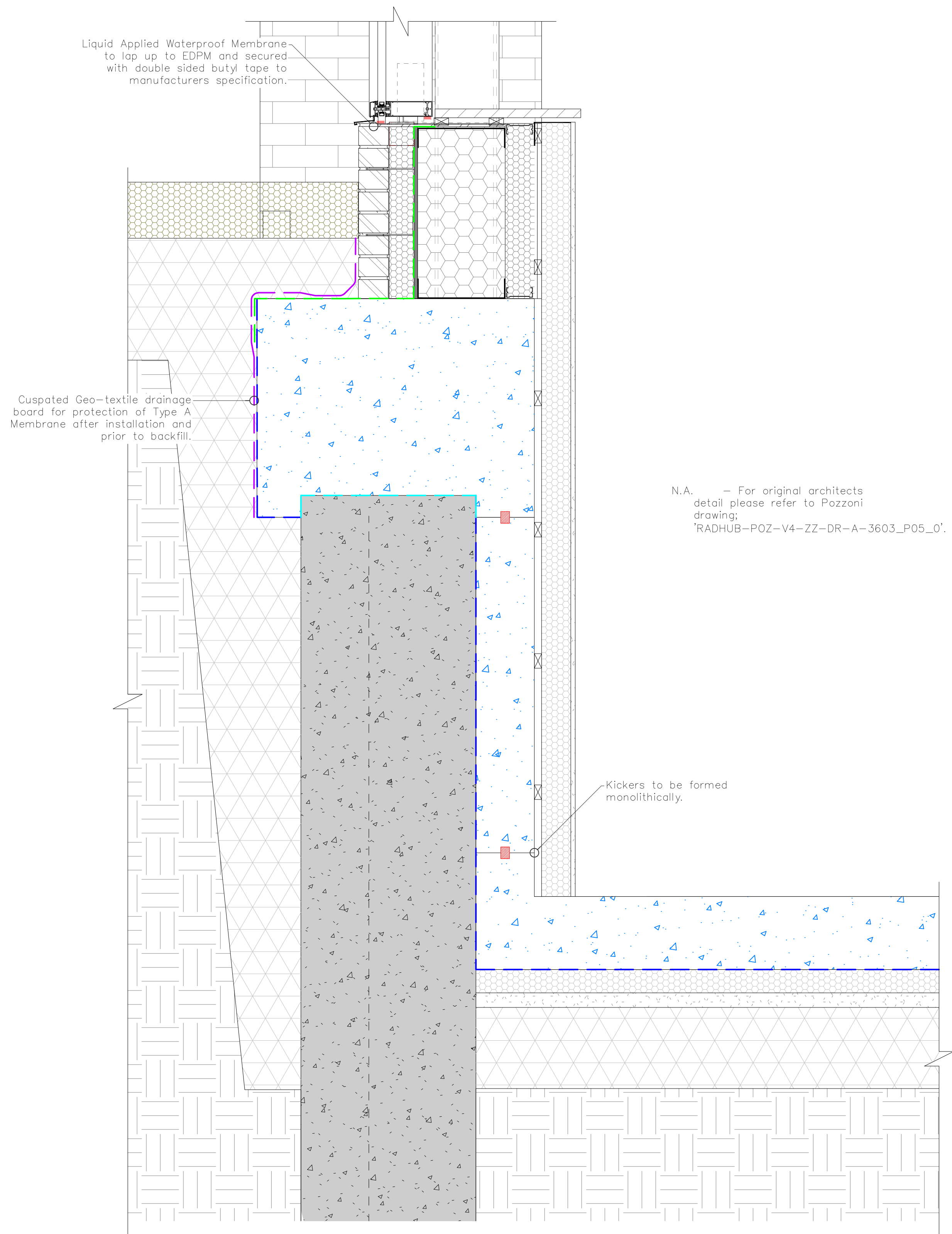
KEY	
GP1 SAM	
GP5 DPM + Fleece	
GP Liquid Barrier	
PD1700	

Rev C02	24/05/24 – ME
Supplier change	
Rev C01	21/02/24 – ME
Construction stage issue	
Rev P02	25/09/23 – LD
DRG updated In-line with VINCI Project Naming Convention	
Rev P01	13/09/23 – LD
First Issue	

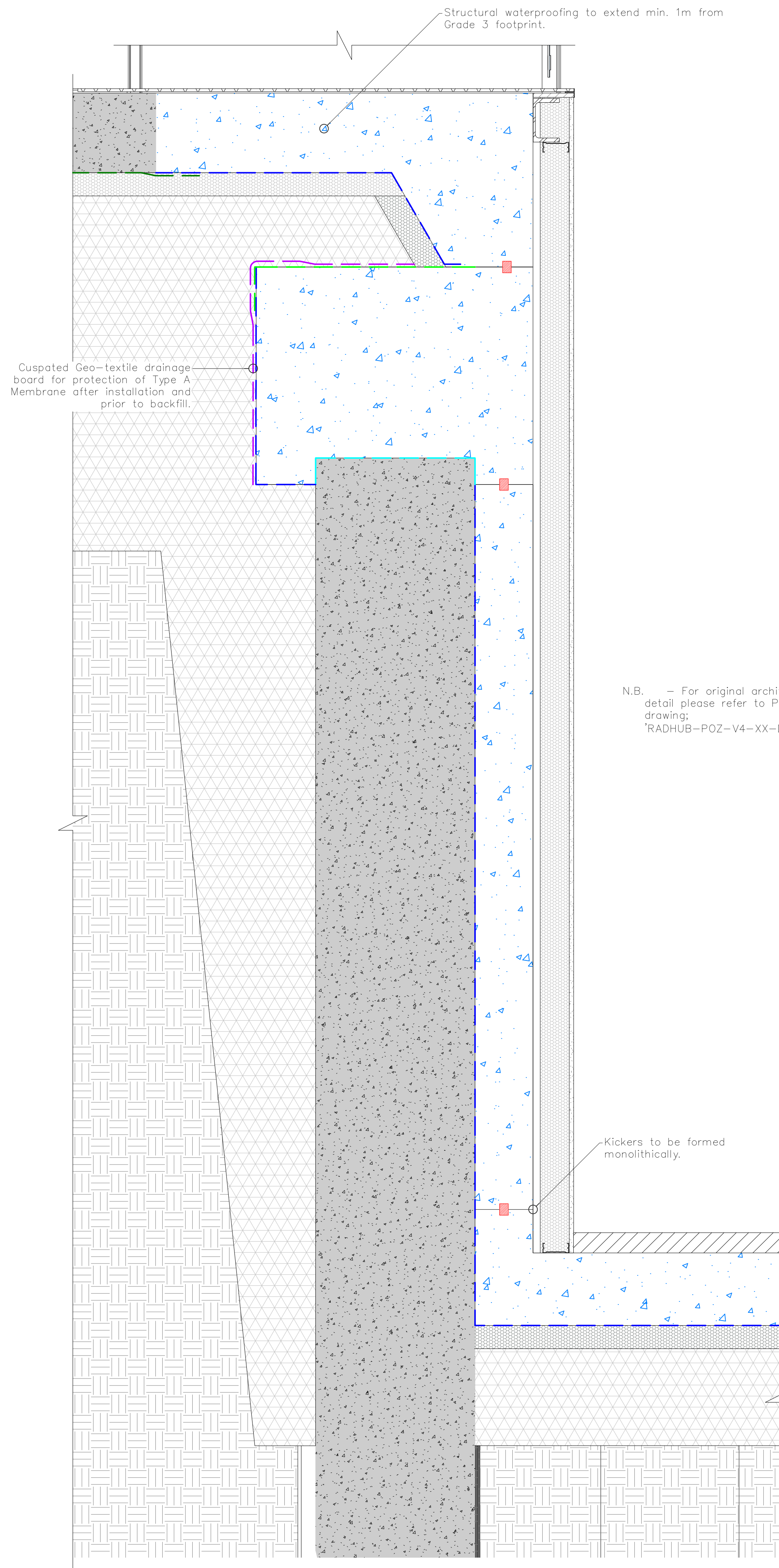


PROJECT
Radcliffe
CLIENT
AJP
DRAWING TITLE
Building Perimeter Curtain Wall Level Threshold
DRAWING NUMBER
RADHUB-PHA-V4-00-DR-Y-0002
REVISION
C02
STATUS
CONSTRUCTION
SCALE
1:10 on A3

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info@philhewitt.co.uk |
www.philhewitt.co.uk
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1 Piled Retaining Wall Detail
Scale: 1:10



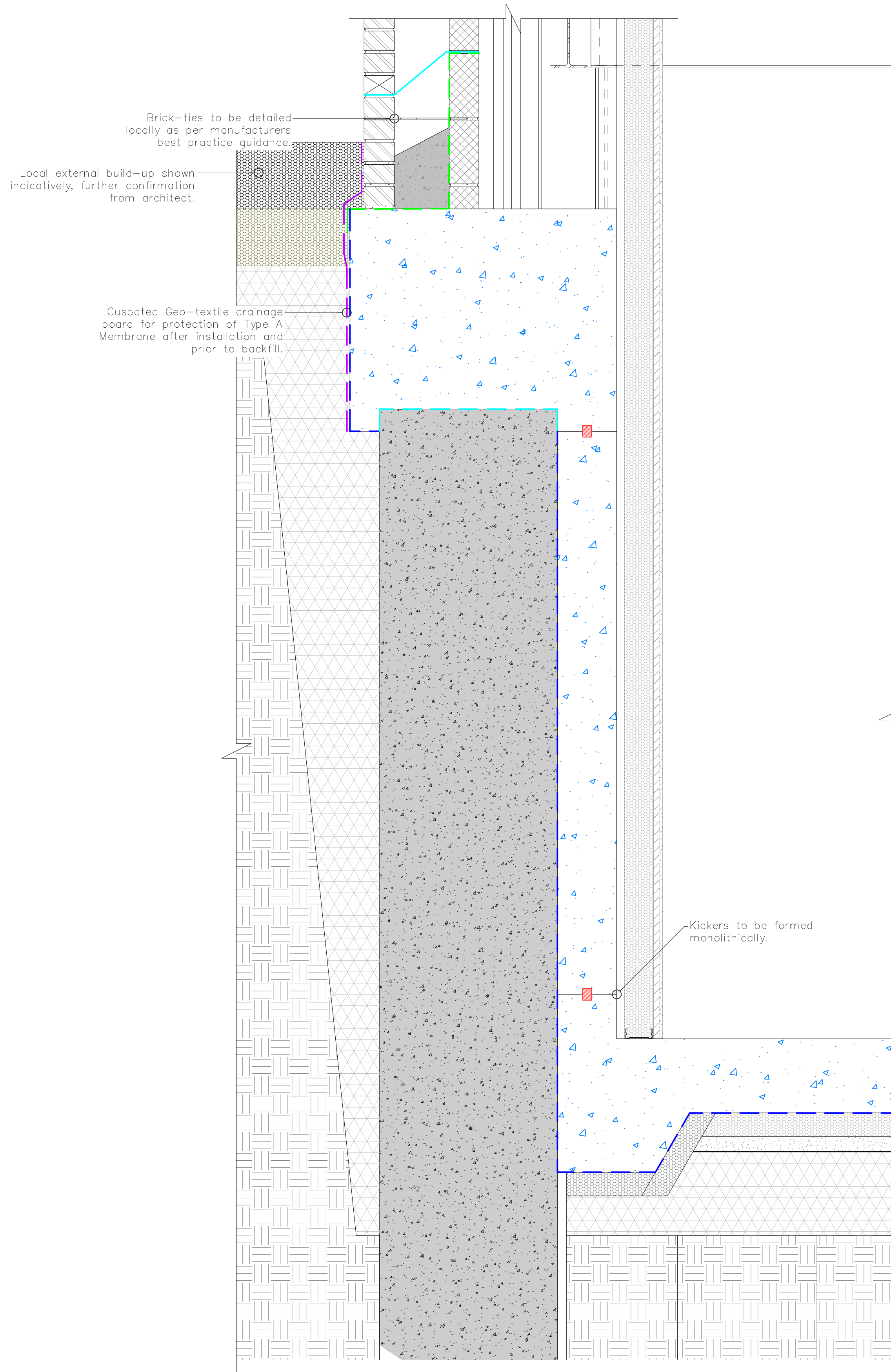
2 Piled Retaining Wall to Intermediate Slab Detail
Scale: 1:50

KEY	
GP5 DPM	
GP Liquid Barrier	
GP1 SAM	
GP Titanbond	
Hydrophilic Waterbar	
Waterproof Concrete	
PD1700	

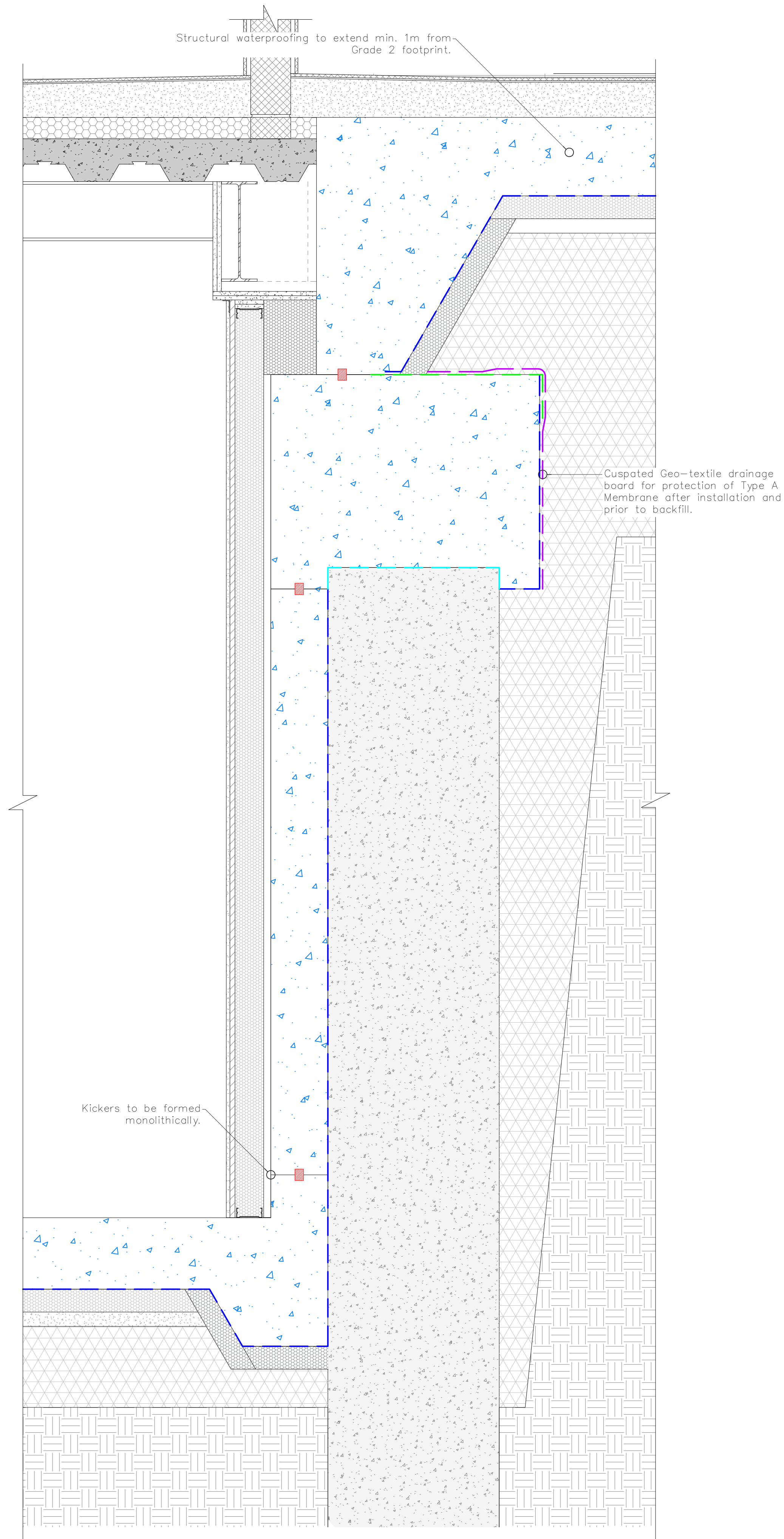
Rev C03	24/05/24	ME
Supplier change		
Rev C01	21/02/24	ME
Construction stage issue		
Rev P02	25/09/23	LD
DWG updated in-line with WHG Project Meeting Convention		
Rev P01	13/09/23	LD
First issue		

PROJECT	Radcliffe
CLIENT	AJP
DRAWING TITLE	Clip and Climb Retaining Wall
DRAWING NUMBER	RADHUB-PHA-V4-B1-DR-Y-0003
REVISION	C02
STATUS	CONSTRUCTION
SCALE	as shown on A1

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www.independent.co.uk
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1 Water Tank Piled Retaining Wall Detail
Scale: 1:10



2 Plant Room Piled Retaining Wall to Intermediate Slab Detail
Scale: 1:50

KEY	
GP5 DPM	
GP Liquid Barrier	
GP1 SAM	
GP Titanbond	
Hydrophilic Waterbar	
Waterproof Concrete	
PD1700	

Rev C02	24/05/24	ME
Supplier change		
Rev C01	21/02/24	ME
Construction stage issue		
Rev P02	25/09/23	LD
DES updated in-line with WHG Project Naming Convention		
Rev P01	14/09/23	LD
First Issue		

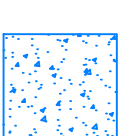
PROJECT	
Radcliffe	
CLIENT	
AJP	
DRAWING TITLE	
Plant and Waterstorage Retaining Wall	
DRAWING NUMBER	
RADHUB-PHA-V4-B1-DR-Y-0004	
REVISION	
C02	
STATUS	
CONSTRUCTION	
SCALE	
C01	

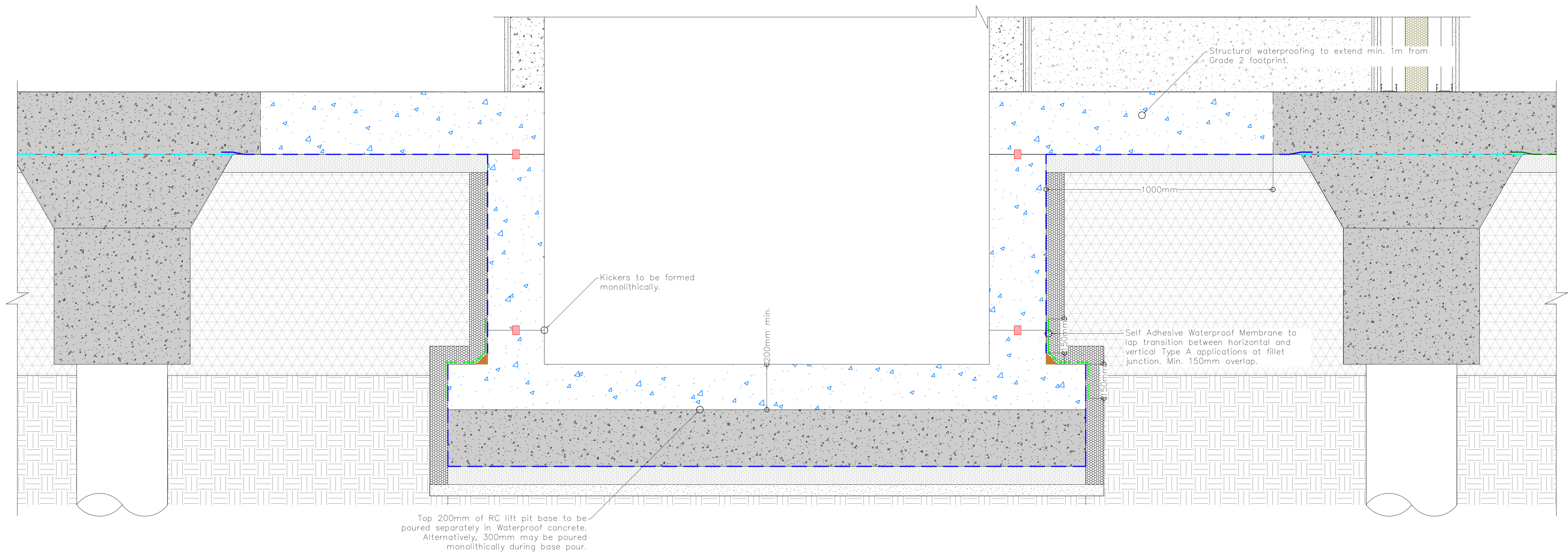
PHIA

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KEY	
	GP5 DPM
	GP Liquid Barrier
	GP1 SAM
	GP Titanbond
	Hydrophilic Waterbar
	Waterproof Concrete
	PD1700

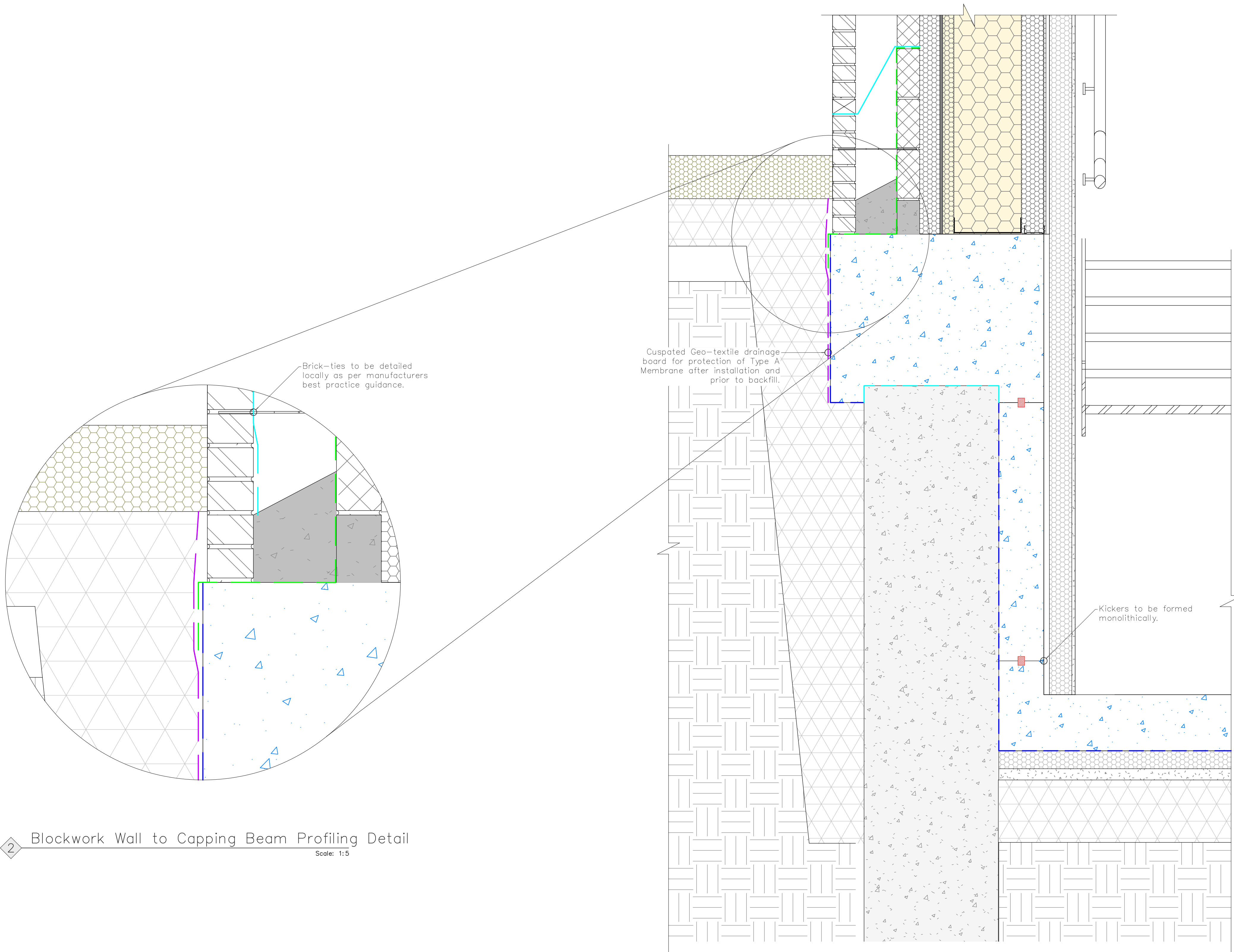


Rev C02	24/08/24 - MC
Supplier change	
Rev C01	21/02/24 - MC
Construction stage issue	
Rev PQ2	25/09/23 - LD
DSD updated in-line with WMO Project Naming Convention	
Rev PQ1	14/09/23 - LD
First issue	

	
PROJECT	Radcliffe
CLIENT	AJP
DRAWING TITLE	LIFT PIT
DRAWING NUMBER	RADHUB-PHA-V4-B1-DR-Y-0005
REVISION	
STATUS	CONSTRUCTION
SCALE	1:10 on A1
INDEPENDENT WATERPROOFING CONSULTANTS	
info@phewa.co.uk www.phewa.co.uk 0208 067 3032	

KEY

GP5 DPM

GP Liquid Barrier

2

Blockwork Wall to Capping Beam Profiling Detail

Scale: 1:5

1

Staircore Piled Retaining Wall Detail

Scale: 1:10

Rev: 001	24/06/24	- MC
Supplier change		
Rev: 001	01/02/24	- MC
Construction stage issue		
Rev: 002	25/09/23	- LD
DES updated in-line with WHG Project Naming Convention		
Rev: 001	15/09/23	- LD
First Issue		

PHIA

INDEPENDENT WATERPROOFING CONSULTANTS

PROJECT

Radcliffe

CLIENT

AJP

DRAWING TITLE

Staircore Retaining Wall

DRAWING NUMBER

RADHUB-PHIA-V4-B1-DR-Y-0006

REVISION

002

STATUS

CONSTRUCTION

SCALE

as shown on A1

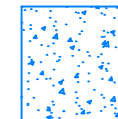
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www.phiawaterproofing.co.uk
0208 067 3032

KEY

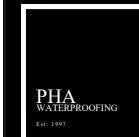


Hydrophilic
Waterbar



Waterproof
Concrete

Rev C01	21/02/24 – ME
Construction stage issue	
Rev P02	25/09/23 – LD
DRG updated in-line with VINCI Project Naming Convention	
Rev P01	15/09/23 – LD
First Issue	



PROJECT

Radcliffe

CLIENT

CONSTRUCTION

DRAWING TITLE

RC Slab Joint

DRAWING NUMBER

RADHUB-PHA-V4-ZZ-DR-Y-0007

REVISION

C01

STATUS

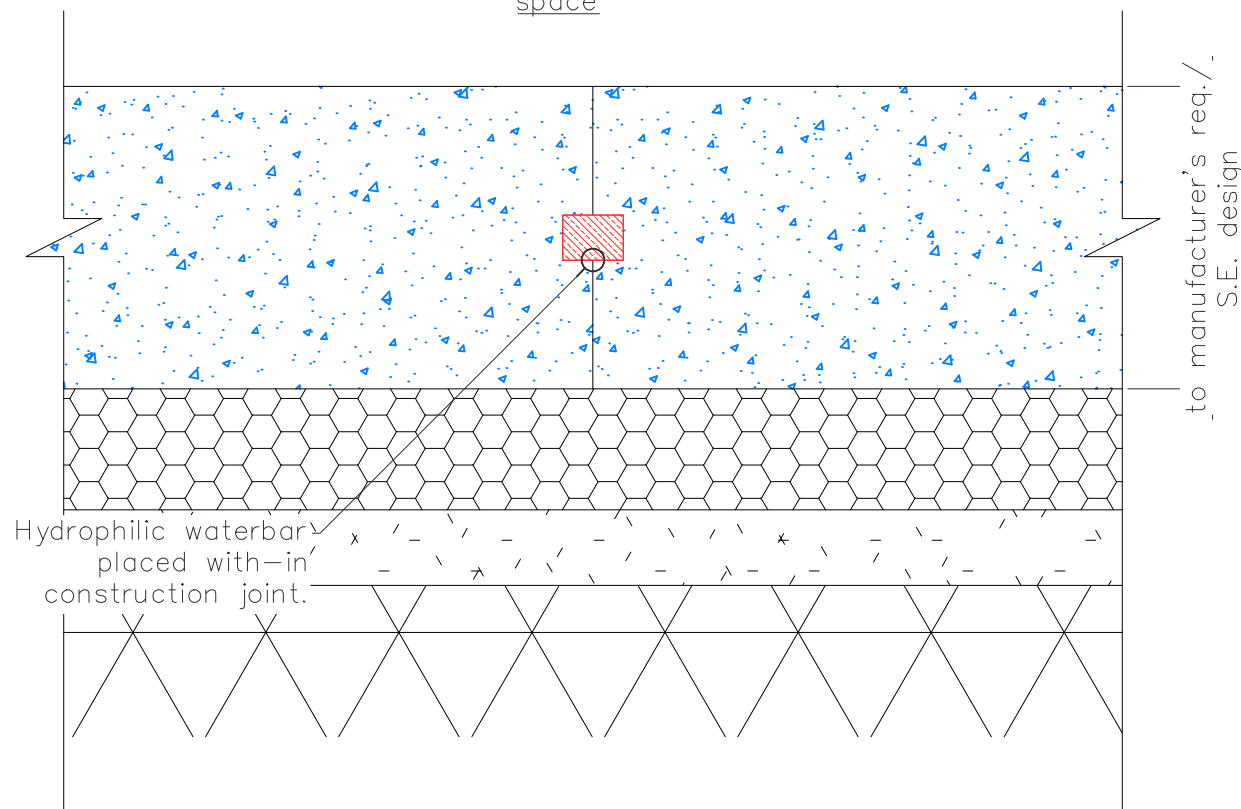
PRELIMINARY

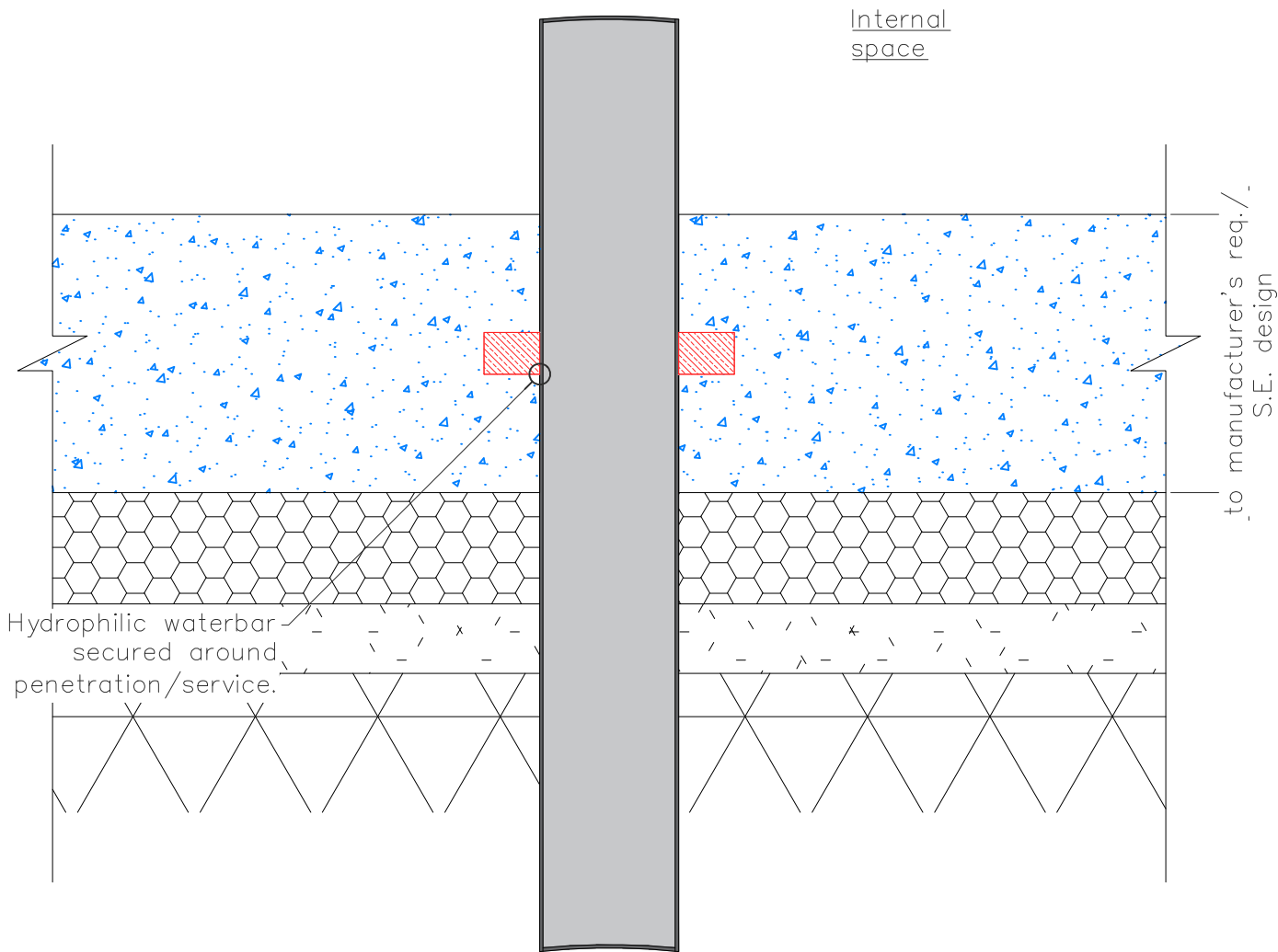
SCALE

1:5 on A4

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0208 087 3032

Internal
space

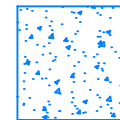




KEY



Hydrophilic
Waterbar



Waterproof
Concrete

Rev C01	21/02/24 – ME
Construction stage Issue	
Rev P02	25/09/23 – LD
DRG updated in-line with VINCI Project Naming Convention	
Rev P01	15/09/23 – LD
First Issue	



PROJECT

Radcliffe

CLIENT

AJP

DRAWING TITLE

RC Slab Pipe Penetration Cast-in

DRAWING NUMBER

RADHUB-PHA-V4-ZZ-DR-Y-0008

REVISION

C01

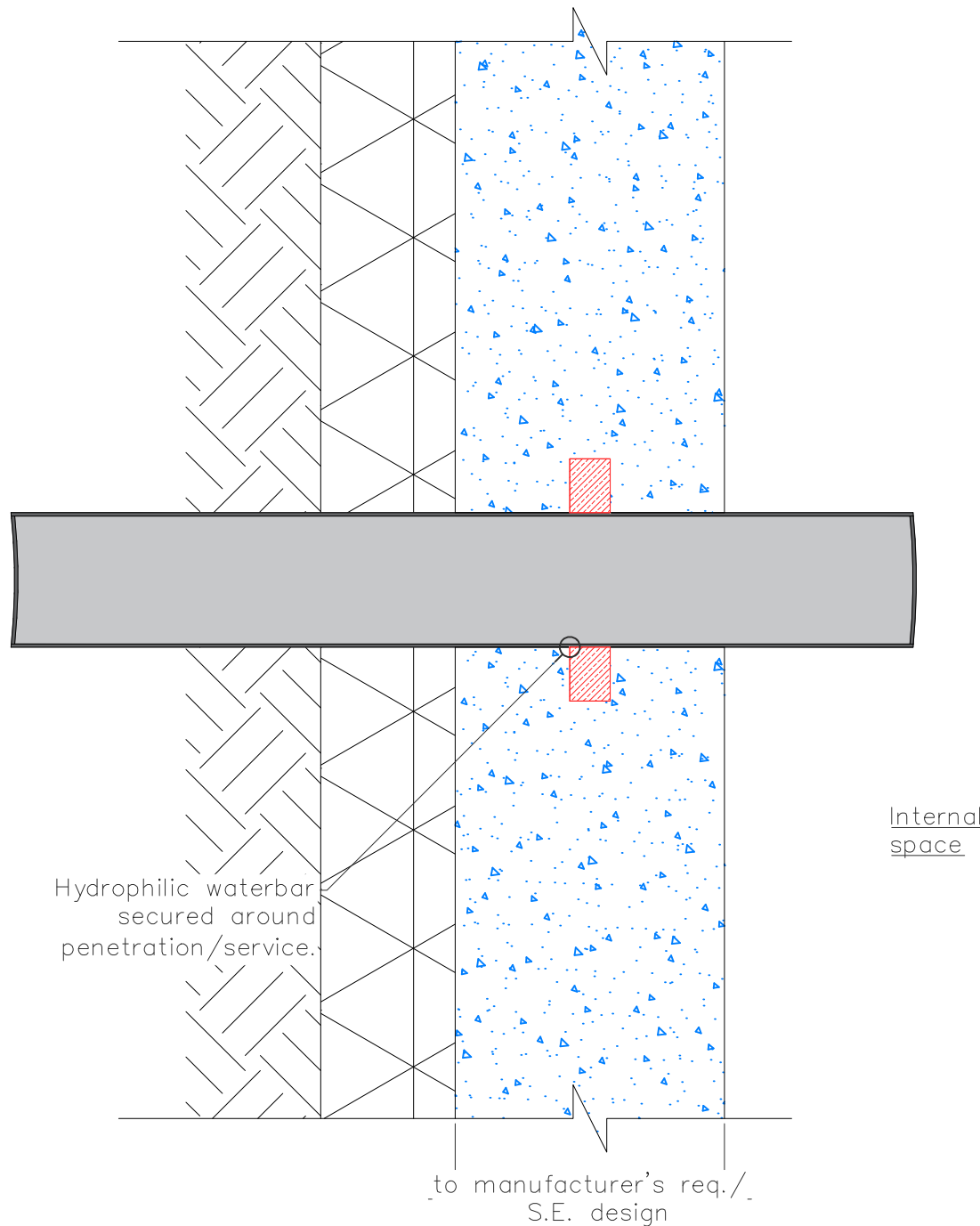
STATUS

CONSTRUCTION

SCALE

1:5 on A4

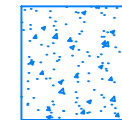
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www.philhewitt.co.uk
0208 087 3032



KEY

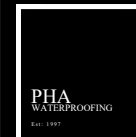


Hydrophilic
Waterbar



Waterproof
Concrete

Rev C01	21/02/24 – ME
Construction stage issue	
Rev P02	25/09/23 – LD
DRG updated in-line with VINCI Project Naming Convention	
Rev P01	15/09/23 – LD
First Issue	



PROJECT

Radcliffe

CLIENT

AJP

DRAWING TITLE

RC Wall Pipe Penetration Cast-in

DRAWING NUMBER

RADHUB-PHA-V4-ZZ-DR-Y-0009

REVISION

C01

STATUS

CONSTRUCTION

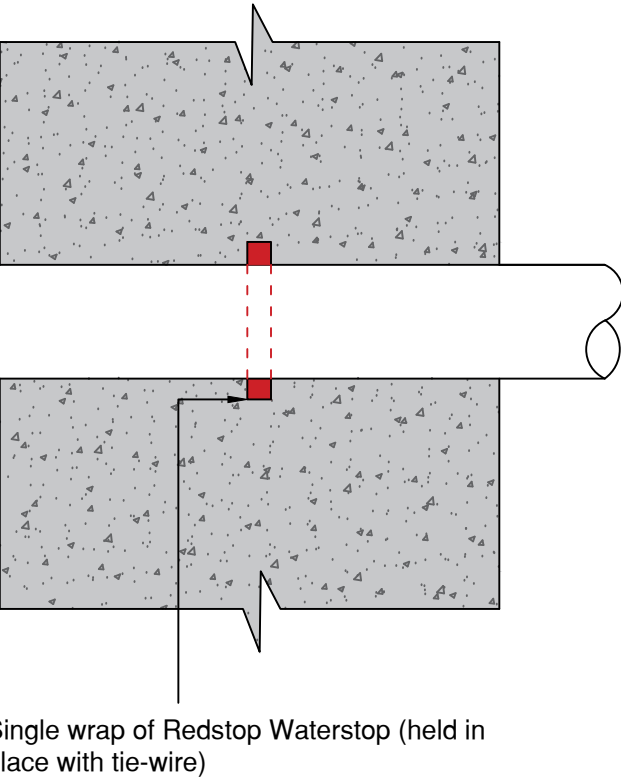
SCALE

1:5 on A4

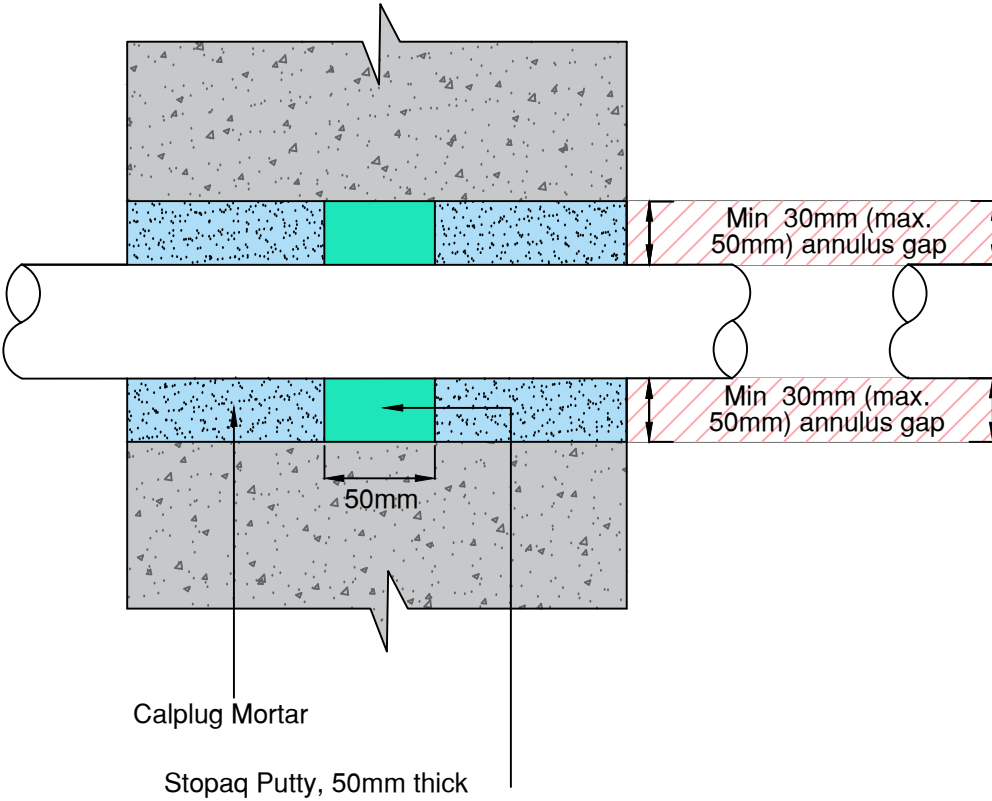
INDEPENDENT WATERPROOFING CONSULTANTS
info@philhewitt.co.uk |
www.philhewitt.co.uk
0208 087 3032

TYPICAL PIPE PENETRATIONS

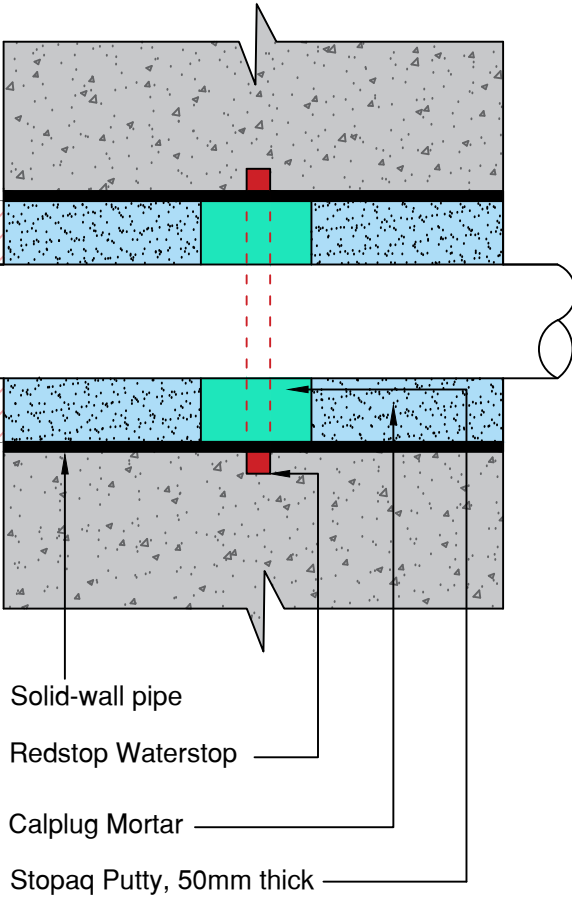
TYPICAL CAST-IN SERVICE PIPE WATERPROOFING DETAIL



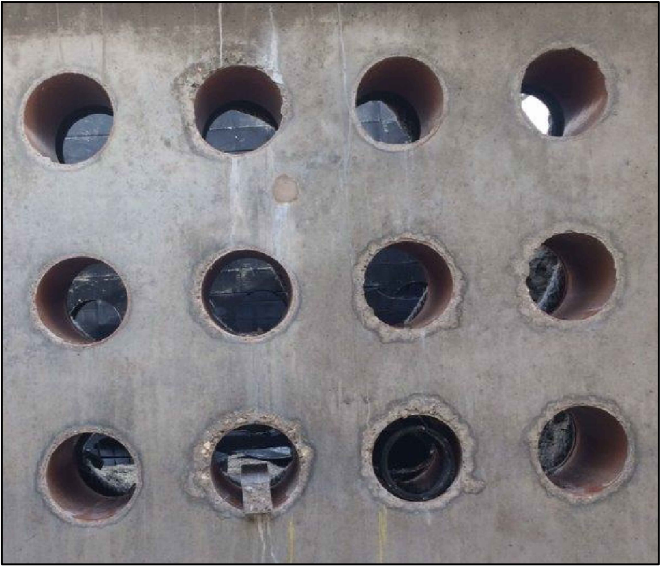
TYPICAL WATERPROOFING DETAIL FOR SERVICE PIPE THROUGH A CORED HOLE



TYPICAL WATERPROOFING DETAIL FOR SERVICE PIPE THROUGH A CAST-IN DUCT



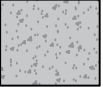
Note: Where multiple services are cast into a slab or wall - as shown below - there should be a minimum gap between pipes of 70mm.



NOTE: The waterproofing details for the cored hole and duct are only covered by the Cementaid waterproofing guarantee if the sealing is done by Cementaid as a chargeable item.



KEY

 = Caltite waterproof concrete. To be a min. of 200mm thick

Note: Where we are given design drawings and asked to comment on the use of Everdure Caltite to provide integral concrete waterproofing, where specified, please note that, whilst we will make every effort to comment appropriately on issues required by the Cementaid specification for the use of Everdure Caltite, we accept no responsibility or liability whatsoever in regard to the structural detailing and design.

PIPE PENETRATIONS & SERVICE DUCTS:

Where service pipes or penetration sleeves are cast in place, a single piece of Redstop Waterstop should be placed around the sleeve and held in place with tie-wire. The minimum cover from the face of the concrete to the joint-strip wrapped around the pipe is 70mm.

Care must be taken not to drop or pour concrete directly onto pipe surfaces as this could dislodge the Redstop Waterstop. Extra attention must be paid to ensure full compaction of the concrete around service penetrations and the proper placement and withdrawal of the poker vibrator around all penetrations, recognising that a normal 50mm poker will only vibrate concrete within 250mm of where it is inserted.

Where multiple services are cast into a wall or through a slab, there should be a minimum gap between pipes of 70mm.

Prior to placing concrete, the Redstop Waterstop must be protected from water to prevent it from swelling. If it expands prior to concrete being placed, it will have to be taken out and replaced.

PLEASE NOTE: Twinwall flexible piping should NOT be used to form service entry ducts through Caltite concrete.

CEMENTAID

1 Baird Close Crawley, West Sussex, RH10 9SY
P: 01293 653900 F: 01293 447880
E: info@cementaid.co.uk



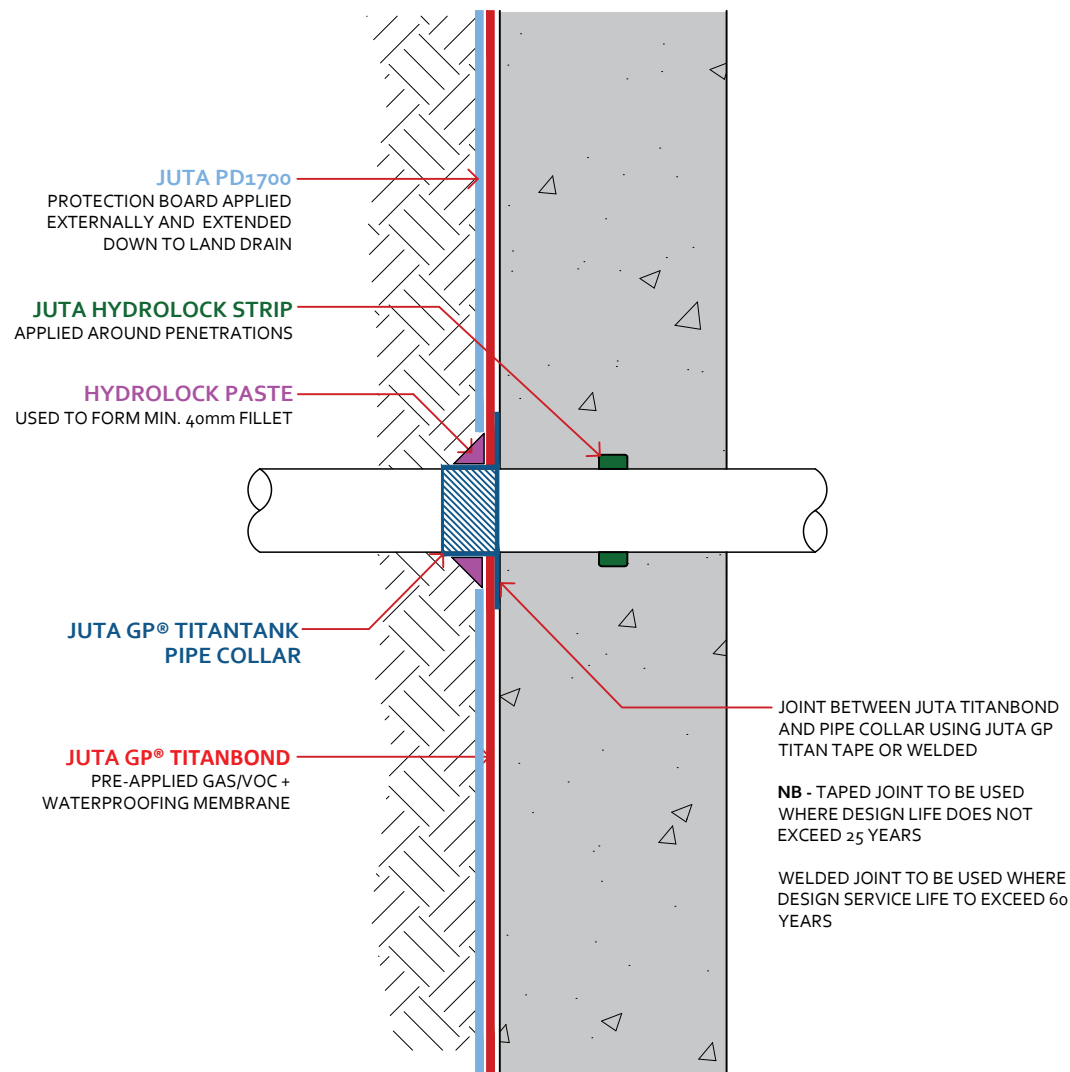
Project: Radcliffe Hub, Bury

Client: Vinci

Title: Typical Service Penetrations (RS)

Date: 7-5-24

Drawing No. : RH-06



CLIENT
JUTA UK LTD

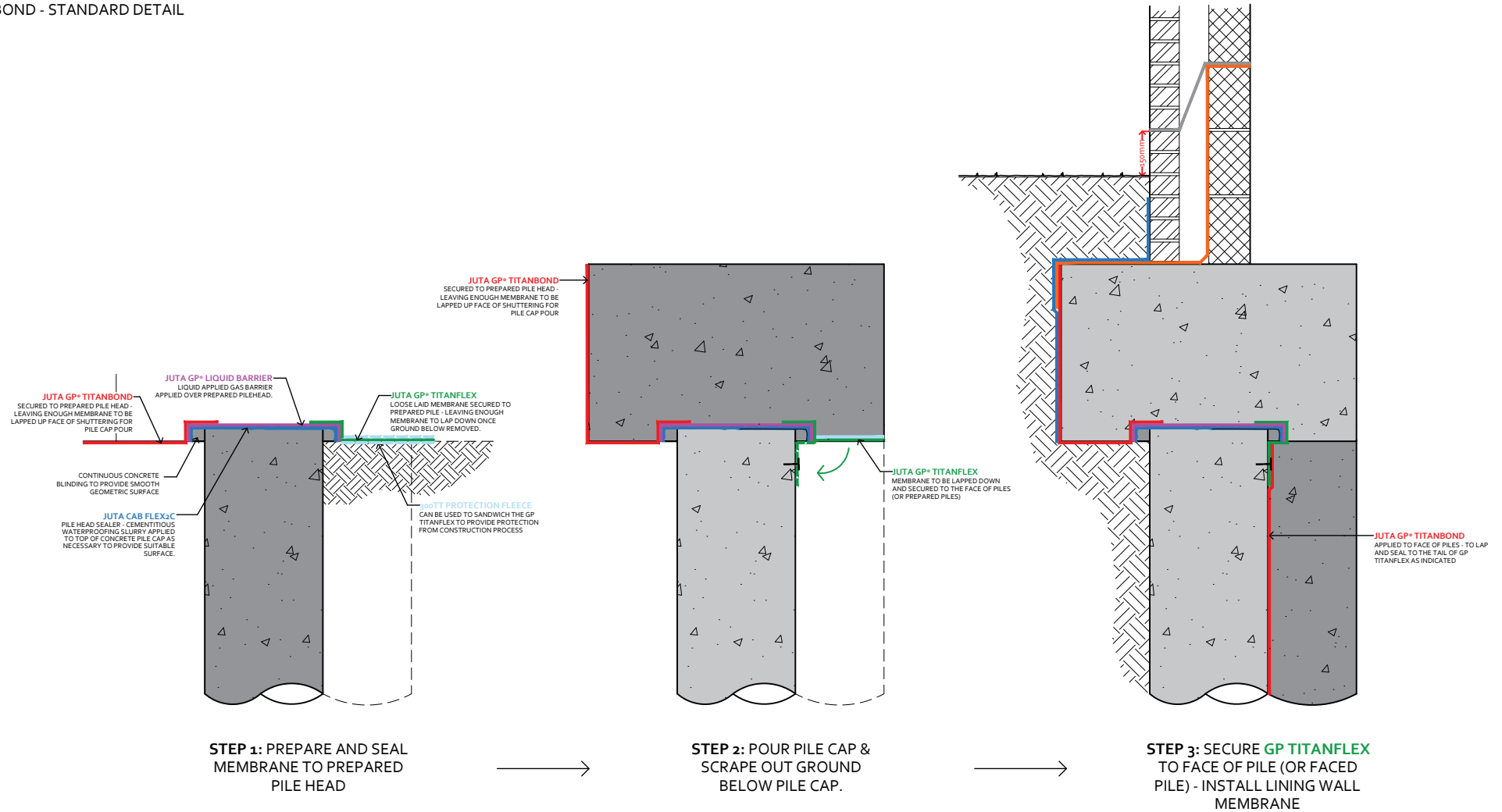
PROJECT
GP® TITANBOND - Standard Details



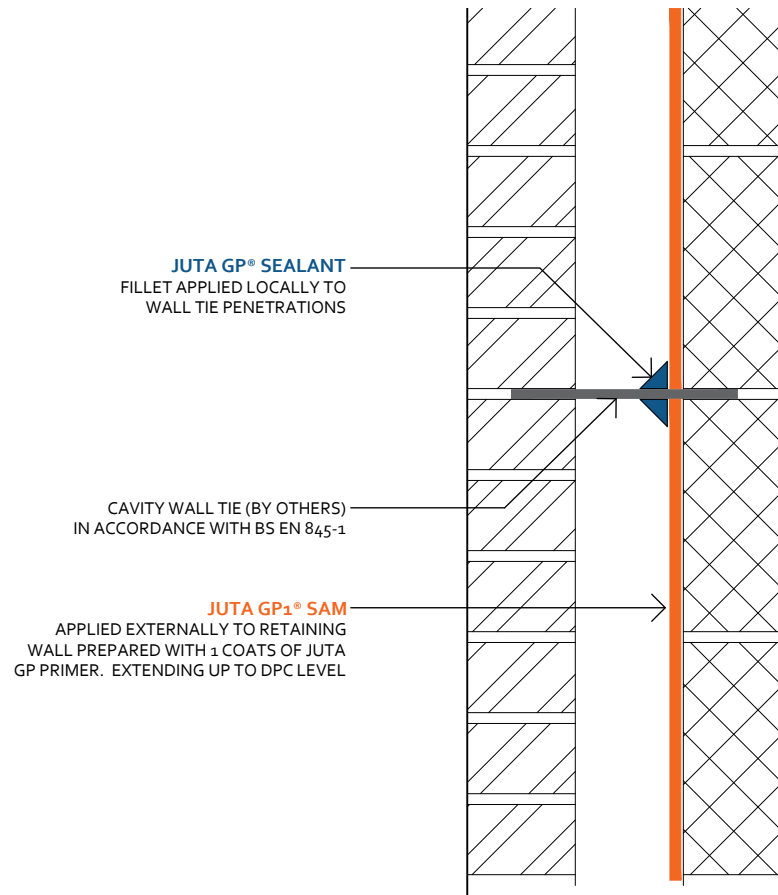
- NOTES
- Detail is generic to application so should not be used as a guide not a specific installation detail.
 - GP®TITANBOND is a TYPE A Waterproofing membrane, in accordance with BS8102:2009, suitable for Grade 1, 2 and 3 Basement constructions.
 - GP® TITANBOND is a proprietary gas and VOC resistant DPM, manufactured and certified to adhere to the requirements of BS8485: 2015+A1: 2019 and CIRA C748: 2014 as a radon, carbon dioxide, methane and VOC barrier.
 - Jointing and sealing using tapes is acceptable where anticipated design service life does not exceed 25 years.
 - Jointing and sealing by hot air welding is recommended where the anticipated design service life is required to exceed 60 years.
 - The use of butyl and bitumen based tapes in environments where VOC and Hydrocarbons are a perceived risk should be avoided. A thermal/welded joint system should be adopted.
 - It should be noted that the suitability of the welded joint is defined by the joint integrity, as tested in accordance with CIRA C735: 2014. This is most commonly tested by air lance integrity testing to ASTM D4437-08: 2013. If the joint passes this test it is deemed acceptable in the verification process.
 - In all cases it is recommended the installation of gas barrier geomembranes is completed by a suitably qualified and accredited installer (NVQ L2/TW/CSWIP or equivalent). Juta UK can offer advice as to the suitable/recommended installers.
 - The gas protection system installation should be subject to third-party independent verification, in accordance with BS8485: 2015 +A1: 2019 and CIRA C735: 2014.
 - All design decisions made by others that might have an impact on the gas and waterproof design performance should be brought to the attention of the design team and Juta UK Ltd. Final decisions and/or any recommendations should be approved by the design team and Juta UK Ltd.
 - Dimensions are not to be scaled from this drawing. All written measurements are to be checked on site by the contractor.
 - All rights described in chapter IV of the copyright, design and patents act 1988 have been generally asserted.

DRAWING TITLE JUTA GP® TITANBOND SINGLE HORIZONTAL PIPE PENETRATION			
DRAWING NUMBER JUTA.TB.017			
DRAWN BY PD	CHECKED BY PF	SCALE Not to Scale	DATE Dec. 2020
		MELTON GROVE WORKS BLACKPOOL ROAD LYTHAM FY8 5PL Tel: 01772 754177	

GAS/ VOC/ WATERPROOF MEMBRANE
GP®TITANBOND - STANDARD DETAIL



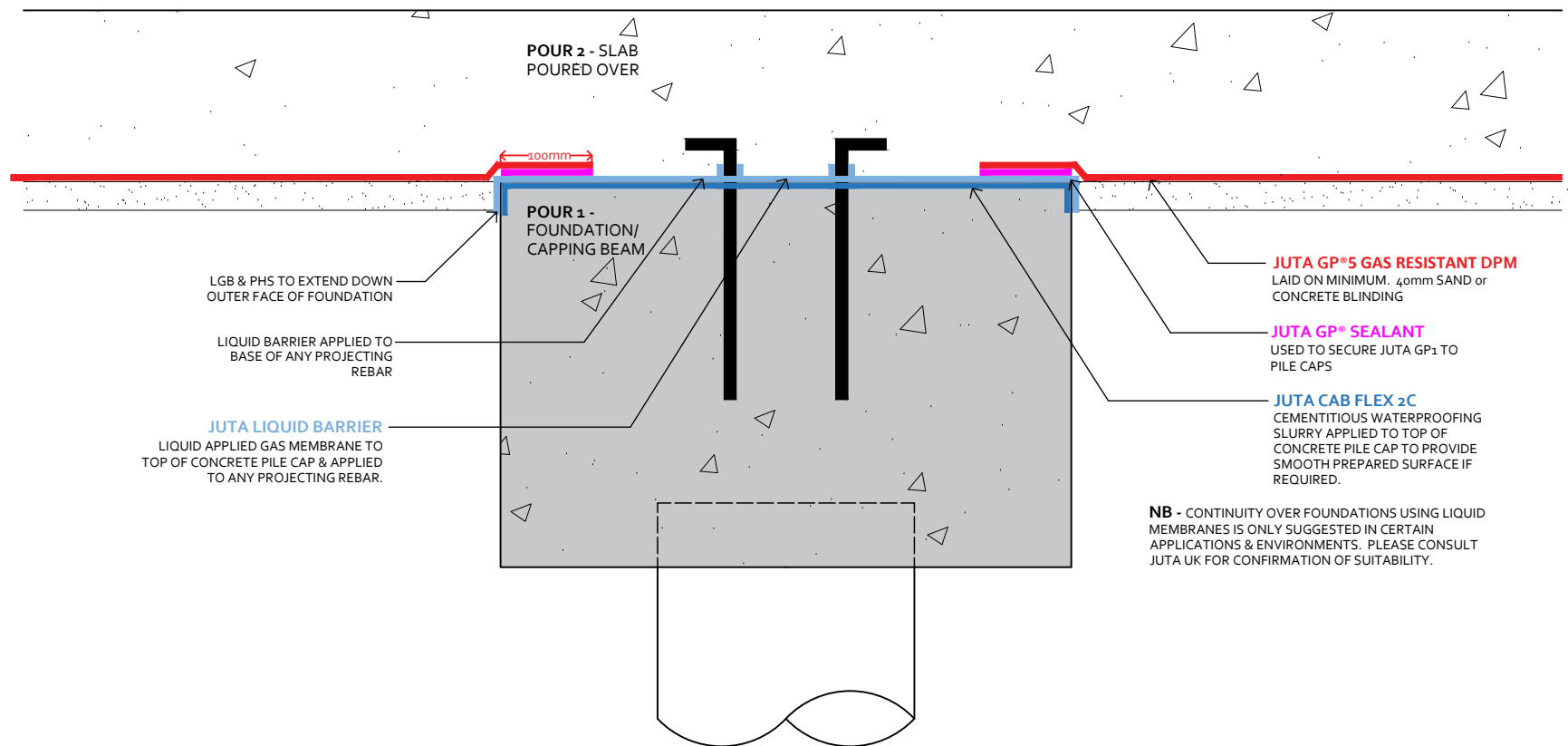
DRAWING TITLE				JUTA UK MELTON GROVE WORKS BLACKPOOL ROAD LYTHAM FY8 5PL Tel: 01772 754377 Email: info@juta.co.uk www: juta.co.uk	NOTES - Detail is generic to application so should not be used as a guide not a specific installation detail. - GP®TITANBOND is a TYPE A Waterproofing membrane, in accordance with BS8102:2009, suitable for Grade 1, 2 and 3 Basement constructions. - GP® TITANBOND is a proprietary gas and VOC resistant DPM, manufactured and certified to adhere to the requirements of BS8485: 2015+A1: 2019 and CIRIA C748: 2014 as a radon, carbon dioxide, methane and VOC barrier. - Joining and sealing using tapes is acceptable where anticipated design service life does not exceed 25 years. - Joining and sealing by hot air welding is recommended where the anticipated design service life is required to exceed 60 years. - The use of butyl and bitumen based tapes in environments where VOC and Hydrocarbons are a perceived risk should be avoided. A thermal/welded joint system should be adopted. - It should be noted that the suitability of the welded joint is defined by the joint integrity, as tested in accordance with CIRIA C735: 2014. This is most commonly tested by air lance integrity testing to ASTM D4437-08: 2013. If the joint passes this test it is deemed acceptable in the verification process. - In all cases it is recommended the installation of gas barrier geomembranes is completed by a suitably qualified and accredited installer (NVQ L2/TWI/CSWIP or equivalent). Juta UK can offer advice as to the suitable/recommended installers. - The gas protection system installation should be subject to third-party independent verification, in accordance with BS8485: 2015 +A1: 2019 and CIRIA C735: 2014. - All design decisions made by others that might have an impact on the gas and waterproof design performance should be brought to the attention of the design team and Juta UK Ltd. Final decisions and/or any recommendations should be approved by the design team and Juta UK Ltd. - Dimensions are not to be scaled from this drawing. All written measurements are to be checked on site by the contractor. - All rights described in chapter IV of the copyright, design and patents act 1988 have been generally asserted.
JUTA GP® TITANBOND PILED WALL HEAD - SEQUENCING DETAIL					
DRAWING NUMBER					
TD-JUTA.GPTB.073					
DRAWN BY	CHECKED BY	SCALE	ISSUE DATE		
PD	PF	NTS	03.2022		
 					



CLIENT	JUTA UK LTD
PROJECT	JUTA GP ₁ [®] SAM Typical Details
	

- NOTES
- Detail is generic to application so should be used as a guide not a specific installation detail.
 - JUTA suggest that waterproofing membranes including JUTA GP₁ SAM should be installed by suitably experienced persons. If unfamiliar with products and applications, please contact JUTA for Specialist Contractors Details.
 - JUTA GP₁ SAM can be applied to reinforced concrete, concrete blockwork and masonry. It can also be applied to various masonry wall systems (i.e. ICF or Stepoc.) but please contact JUTA or a specialist to confirm suitability of primers and adhesive on structure.
 - All surfaces must be prepared with 1 coats of JUTA GP Primer before application. Please refer to JUTA SAM Installation Guide for further information
 - All externally applied membrane should be protected from damage prior to backfilling. This can be achieved using standard protection boards or better still, JUTA PD1700 which is a protection and drainage sheet layer which additionally creates a void between the membrane and earth to reduce the change of hydrostatic pressure onto the structure and direct any groundwater to land drain locations.
 - All design decisions made by others that might have an impact on the gas and waterproof design performance should be brought to the attention of the design team and Juta UK Ltd. Final decisions and/or any recommendations should be approved by the design team and Juta UK Ltd.
 - Dimensions are not to be scaled from this drawing. All written measurements are to be checked on site by the contractor.
 - All rights described in chapter IV of the copyright, design and patents act 1988 have been generally asserted.

DRAWING TITLE			
JUTA GP₁ SAM CAVITY WALL TIE PENETRATION DETAIL			
DRAWING NUMBER			
JUTA.GP ₁ -SAM.017			
DRAWN BY	CHECKED BY	SCALE	DATE
PD	PF	Not to Scale	Sep. 2020
		MELTON GROVE WORKS BLACKPOOL ROAD LYTHAM FY8 5PL Tel: 01772 754177	



CLIENT	JUTA UK LTD
PROJECT	JUTA GP®5 GAS MEMBRANE STANDARD DETAILS
	JUTA UK MELTON GROVE WORKS BLACKPOOL ROAD LYTHAM FY8 5PL Tel: 01772 754177 E-mail: info@juta.co.uk

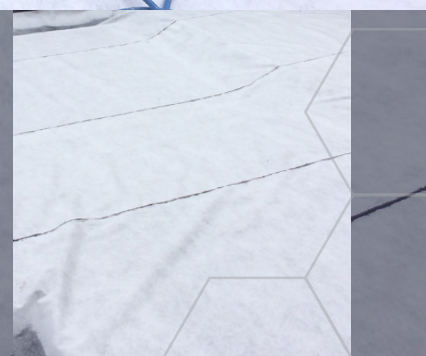
NOTES
- Detail is generic to application so should be used as a guide not a specific installation detail. - GP® 5 is a high performance gas resistant DPM, manufactured and certified to adhere to the requirements of BS8485: 2015 +A1: 2019 as a radon, carbon dioxide and methane barrier. - GP®5 provides radon protection, in accordance with Approved Doc C (UK) and Technical Guidance Document C (Ireland). - Jointing and sealing using tapes is acceptable where anticipated design service life does not exceed 25 years. - Jointing and sealing by hot air welding is recommended where the anticipated design service life is required to exceed 60 years. - The use of butyl and bitumen based tapes in environments where VOC and Hydrocarbons are a perceived risk should be avoided. A thermal/welded joint system should be adopted. - It should be noted that the suitability of the welded joint is defined by the joint integrity, as tested in accordance with CIRIA C735: 2014. This is most commonly tested by air lance integrity testing to ASTM D4437-08: 2013. If the joint passes this test it is deemed acceptable in the verification process. - In all cases it is recommended the installation of gas barrier geomembranes is completed by a suitably qualified and accredited installer (NVQ L2/TWI/CSWIP or equivalent). Juta UK can offer advice as to the suitable/recommended installers. - The gas protection system installation should be subject to third-party independent verification, in accordance with BS8485: 2015 +A1: 2019 and CIRIA C735: 2014. - All design decisions made by others that might have an impact on the gas and waterproof design performance should be brought to the attention of the design team and Juta UK Ltd. Final decisions and/or any recommendations should be approved by the design team and Juta UK Ltd. - Dimensions are not to be scaled from this drawing. All written measurements are to be checked on site by the contractor. - All rights described in chapter IV of the copyright, design and patents act 1988 have been generally asserted.

DRAWING TITLE	JUTA GP®5 GAS MEMBRANES PILE CAP - LIQUID APPLIED MEMBRANE OPTION		
DRAWING NUMBER	JUTA.GP5.043		
DRAWN BY	CHECKED BY	SCALE	DATE
PD	PF	Not to Scale	June. 2021
PROJECT REFERENCE			
A: STANDARD DETAIL ISSUE			

Appendix B



GP® TITANBOND®



GP® TITANBOND® is a pre-applied fully bonded waterproofing membrane incorporating the GP® TITANFLEX® membrane and a heavy duty virgin polypropylene geotextile. The geotextile is laminated to the membrane to provide a dual function; protecting the membrane from damage and providing an integrated 'bond' to poured concrete, ensuring a fully bonded waterproofing barrier which has exceptionally high resistance to ground gases and VOCs. GP® TITANBOND® is used for the gas/waterproofing/tanking of underground structure where harmful ground gases are anticipated.

Thickness	2.0 mm
Width	1.9 m
Length	25 m
Weight	650 g/m ²

TITANTECH®

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

Handling

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

Storage

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





Feature	Characteristics	Test Method	GP® TITANBOND®
Physical Properties	Thickness	EN 1849-2	2.0 mm
	Width	EN 1849-2	1.9 m
	Length	EN 1849-2	25 m
	Weight	EN 1849-2	650 g/m ²
Hydraulic Press	Water Vapour Transmission Rate	EN 1931	0.11 - 0.18 g/m ² /day
	Water Tightness (60 kPa)	EN 1928	Pass
	Water Tightness (196 kPa - 20 m Water Head) (Basement Application)	EN 1928	Pass
Mechanical Properties	Resistance to Static Load	EN 12730-B	≥ 20 kg
	Puncture Resistance	EN 12236	≥ 2.0 kN
	Tensile Strength (MD)	EN 12311-1	> 550 N/50mm
	Tensile Strength (CMD)	EN 12311-1	> 400 N/50mm
	Tensile Elongation (MD/CMD)	EN 12310-1	> 550 %
	Tear Resistance (MD/CMD)	EN 12310-1	> 300 N
	Resistance to Impact	EN 12691-B	> 1650 mm
	Reaction to Fire	EN 13501-1	E Class
	Concrete Peel Adhesion	ASTM D903 (MOD)	> 3.0 kN/m
	Resistance to Artificial Ageing	EN 1296/EN 1928	Pass
	Resistance to Chemicals	EN 1296/EN 1928	Pass
Compliance and Certification	CE Mark - EN13967:2012		
	NHBC Standards Compliant		
	BS 8485:2015 Compliant (Methane and Carbon Dioxide barrier)		
	CIRIA C748 Compliant (VOC Barrier)		
	BS 8102:2009 Compliant (Type A Waterproofing Barrier)		
Vapour Permeability 100% Concentration	Transmission Rate of Benzene	EN ISO 15105-2	< 3.6 mg/m ² /day
	Transmission Rate of Toluene	EN ISO 15105-2	< 13.8 mg/m ² /day
	Transmission Rate of Ethyl Benzene	EN ISO 15105-2	< 2.7 mg/m ² /day
	Transmission Rate of Xylenes (M,P,O)	EN ISO 15105-2	< 7.7 mg/m ² /day
	Transmission Rate of Hexane	EN ISO 15105-2	< 0.6 mg/m ² /day
	Transmission Rate of Vinyl Chloride	EN ISO 15105-2	< 0.05 mg/m ² /day
	Transmission Rate of Trichloroethene (TCE)	EN ISO 15105-2	< 54.7 mg/m ² /day
	Transmission Rate of Tetrachloroethene (PCE)	EN ISO 15105-2	< 26.2 mg/m ² /day
	Transmission Rate of Naphthalene	EN ISO 15105-2	< 0.0006 mg/m ² /day
	Transmission Rate of Cis-1,2-Dichloroethylene	EN ISO 15105-2	< 1.1 mg/m ² /day
Gas Permeability	Methane Permeability	EN ISO 15105-1	0.13 ml/m ² /day/atm
	Methane Permeability (Jointed)	EN ISO 15105-1	1.00 ml/m ² /day/atm
	Carbon Dioxide Permeability	EN ISO 15105-1	3.01 ml/m ² /day/atm
	Vinyl Chloride Gas Permeability	EN ISO 15105-1	0.04 ml/m ² /day/atm
	Radon Permeability	K124/02/95	1.0 x 10 ⁻¹² m ² /S



Feature	Characteristics	Test Method	GP® TITANBOND®
Durability and Chemical Resistance	Chemical Resistance - Sulfuric ACID (10% Solution of Sulfuric Acid (H ₂ SO ₄)) 50° For 56 Days	EN 14414-A	TENSILE STRENGTH RETAINED 100% RESULT - PASS
	Chemical Resistance - BASIC (Calcium Hydroxide Saturated Suspension) 50° For 56 Days	EN 14414-B	TENSILE STRENGTH RETAINED 100% RESULT - PASS
	Chemical Resistance - SOLVENTS (35% Diesel, 35% Paraffin, 30% Oil Hd30 (Vol)) 50° For 56 Days	EN 14414-C	TENSILE STRENGTH RETAINED >80% RESULT - PASS
	Chemical Resistance - SYNTHETIC LEACHATE (Mixture of 14 Acids, Chlorides, Sulphates & Phosphates) 50° For 56 Days	EN 14414-D	TENSILE STRENGTH RETAINED 100% RESULT - PASS
	Resistance to Leaching - HOT WATER (Deionised Water) 50° For 56 Days	EN 14415-A	TENSILE STRENGTH RETAINED 100% RESULT - PASS
	Resistance to leaching - AQUEOUS ALKALINE (Saturated Calcium Hydroxide) 50° For 56 Days	EN 14415-B	TENSILE STRENGTH RETAINED 100% RESULT - PASS
	Resistance to Leaching - ORGANIC ALCOHOL (30% Methanol, 30% Isopropanol, 40% Glycol) 50° For 56 Days	EN 14415-C	TENSILE STRENGTH RETAINED 100% RESULT - PASS
	Chemical Resistance - BENZENE - 100% Saturated Concentration	EN 14414-D (MOD)	TENSILE STRENGTH RETAINED 95% (MD), 102% (CMD) RESULT - PASS
	Chemical Resistance - TOLUENE - 100% Saturated Concentration	EN 14414-D (MOD)	TENSILE STRENGTH RETAINED 94% (MD), 91% (CMD) RESULT - PASS
	Chemical Resistance - ETHYL BENZENE - 100% Saturated Concentration	EN 14414-D (MOD)	TENSILE STRENGTH RETAINED 99% (MD), 97% (CMD) RESULT - PASS
	Chemical Resistance - XYLENES - 100% Saturated Concentration	EN 14414-D (MOD)	TENSILE STRENGTH RETAINED 91% (MD), 106% (CMD) RESULT - PASS
	Chemical Resistance - TCE - 100% Saturated Concentration	EN 14414-D (MOD)	TENSILE STRENGTH RETAINED 99% (MD), 93% (CMD) RESULT - PASS
	Chemical Resistance - PCE - 100% Saturated Concentration	EN 14414-D (MOD)	TENSILE STRENGTH RETAINED 93% (MD), 93% (CMD) RESULT - PASS
	Chemical Resistance - NAPHTHALENE - 100% Saturated Concentration	EN 14414-D (MOD)	TENSILE STRENGTH RETAINED 101% (MD), 93% (CMD) RESULT - PASS
	Chemical Resistance - HEXANE - 100% Saturated Concentration	EN 14414-D (MOD)	TENSILE STRENGTH RETAINED 99% (MD), 104% (CMD) RESULT - PASS



JUTA UK

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

Installation

GP® TITANBOND® should be installed in accordance with the product installation guidelines, and in accordance with best practice.

Jointing and Sealing

GP® TITANBOND® can be heat welded or taped, with jointing carried out by competent personnel with suitable qualifications in accordance with best practice. GP® TITANBOND® should be overlapped by at least 100mm. If taping joints, only suitable tape must be used, ensuring application with a silicone roller to remove trapped air. JUTA pre-formed details, or self adhesive gas membrane are available for sealing around protuberances.

Accessory Products

- GP® DPC
- GP® TAPE
- GP® OVERTAPE
- JUTA 300TT



**GP®
TITANFLEX®**

GP® TITANFLEX® gas and hydrocarbon barrier is a multi-layer, polyethylene membrane. GP® TITANFLEX® is specifically designed, manufactured, tested and certified to perform as a methane, carbon dioxide, radon ground gas, VOC, Air moisture and hydrocarbon protection system.

TITANTECH®

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

GP® TITANFLEX® complies with the latest codes of practice as published by BRE, CIRIA (C748) and BSI (BS8485:2015). Suitable for use as ground gas/hydrocarbon protection for NHBC, Green, Amber 1, Amber 2 and Red site characterisations.

Handling

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

Storage

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

Installation

GP® TITANFLEX® should be installed in accordance with the product installation guidelines, and in accordance with best practice.

Thickness	0.5 mm
Width	2 m
Length	50 m
Weight	500 g/m ²

Certifications



Please
Scan



Rev 2024



Feature	Characteristics	Test Method	GP® TITANFLEX®
Physical Properties	Thickness	EN 1849-2	0.5 mm
	Width	EN 1849-2	2 m
	Length	EN 1849-2	50 m
	Weight	EN 1849-2	500 g/m ²
Hydraulic Press	Water Vapour Transmission Rate	EN 1931	0.11 - 0.18 g/m ² /day
	Water Tightness (60 kPa)	EN 1928	Pass
	Water Tightness (196 kPa - 20 m Water Head) (Basement Application)	EN 1928	Pass
Mechanical Properties	Resistance to Static Load	EN 12730-B	≥ 20 kg
	Puncture Resistance	EN 12236	≥ 2.0 kN
	Tensile Strength (MD)	EN 12311-1	> 550 N/50mm
	Tensile Strength (CMD)	EN 12311-1	> 400 N/50mm
	Tensile Elongation (MD/CMD)	EN 12310-1	> 550 %
	Tear Resistance (MD/CMD)	EN 12310-1	> 300 N
	Resistance to Impact	EN 12691-B	650 mm
	Reaction to Fire	EN 13501-1	E Class
	Resistance to Artificial Ageing	EN 1296/EN 1928	Pass
	Resistance to Chemicals	EN 1296/EN 1928	Pass
Compliance and Certification	CE Mark - EN13967:2012		
	NHBC Standards Compliant		
	CIRIA C748 Compliant		
	BS 8485:2015 Compliant		
Vapour Permeability 100% Concentration	Transmission Rate of Benzene	EN ISO 15105-2	< 3.6 mg/m ² /day
	Transmission Rate of Toluene	EN ISO 15105-2	< 13.8 mg/m ² /day
	Transmission Rate of Ethyl Benzene	EN ISO 15105-2	< 2.7 mg/m ² /day
	Transmission Rate of Xylenes (M,P,O)	EN ISO 15105-2	< 7.7 mg/m ² /day
	Transmission Rate of Hexane	EN ISO 15105-2	< 0.6 mg/m ² /day
	Transmission Rate of Vinyl Chloride	EN ISO 15105-2	< 0.05 mg/m ² /day
	Transmission Rate of Trichloroethene (TCE)	EN ISO 15105-2	< 54.7 mg/m ² /day
	Transmission Rate of Tetrachloroethene (PCE)	EN ISO 15105-2	< 26.2 mg/m ² /day
	Transmission Rate of Naphthalene	EN ISO 15105-2	< 0.0006 mg/m ² /day
	Transmission Rate of CIS-1,2-Dichloroethylene	EN ISO 15105-2	< 1.1 mg/m ² /day
Gas Permeability	Methane Permeability	EN ISO 15105-1	0.13 ml/m ² /day/atm
	Methane Permeability (Jointed)	EN ISO 15105-1	1.00 ml/m ² /day/atm
	Carbon Dioxide Permeability	EN ISO 15105-1	3.01 ml/m ² /day/atm
	Vinyl Chloride Gas Permeability	EN ISO 15105-1	0.04 ml/m ² /day/atm
	Radon Permeability	K124/02/95	1.0 x 10 ⁻¹² m ² /S
	Hydrogen Sulphide Permeability	EN ISO 15105-1	< 0.16 ml/m ² /day/atm



Feature	Characteristics	Test Method	GP® TITANFLEX®
Durability and Chemical Resistance	Chemical Resistance - Sulfuric ACID (10% Solution of Sulfuric Acid (H ₂ SO ₄)) 50° For 56 Days	EN 14414-A	TENSILE STRENGTH RETAINED 100% RESULT - PASS
	Chemical Resistance - BASIC (Calcium Hydroxide Saturated Suspension) 50° For 56 Days	EN 14414-B	TENSILE STRENGTH RETAINED 100% RESULT - PASS
	Chemical Resistance - SOLVENTS (35% Diesel, 35% Paraffin, 30% Oil Hd30 (Vol)) 50° For 56 Days	EN 14414-C	TENSILE STRENGTH RETAINED >80% RESULT - PASS
	Chemical Resistance - SYNTHETIC LEACHATE (Mixture of 14 Acids, Chlorides, Sulphates & Phosphates) 50° For 56 Days	EN 14414-D	TENSILE STRENGTH RETAINED 100% RESULT - PASS
	Resistance to Leaching - HOT WATER (Deionised Water) 50° For 56 Days	EN 14415-A	TENSILE STRENGTH RETAINED 100% RESULT - PASS
	Resistance to leaching - AQUEOUS ALKALINE (Saturated Calcium Hydroxide) 50° For 56 Days	EN 14415-B	TENSILE STRENGTH RETAINED 100% RESULT - PASS
	Resistance to Leaching - ORGANIC ALCOHOL (30% Methanol, 30% Isopropanol, 40% Glycol) 50° For 56 Days	EN 14415-C	TENSILE STRENGTH RETAINED 100% RESULT - PASS
	Chemical Resistance - BENZENE - 100% Saturated Concentration	EN 14414-D (MOD)	TENSILE STRENGTH RETAINED 95% (MD), 102% (CMD) RESULT - PASS
	Chemical Resistance - TOLUENE - 100% Saturated Concentration	EN 14414-D (MOD)	TENSILE STRENGTH RETAINED 94% (MD), 91% (CMD) RESULT - PASS
	Chemical Resistance - ETHYL BENZENE - 100% Saturated Concentration	EN 14414-D (MOD)	TENSILE STRENGTH RETAINED 99% (MD), 97% (CMD) RESULT - PASS
	Chemical Resistance - XYLENES - 100% Saturated Concentration	EN 14414-D (MOD)	TENSILE STRENGTH RETAINED 91% (MD), 106% (CMD) RESULT - PASS
	Chemical Resistance - TCE - 100% Saturated Concentration	EN 14414-D (MOD)	TENSILE STRENGTH RETAINED 99% (MD), 93% (CMD) RESULT - PASS
	Chemical Resistance - PCE - 100% Saturated Concentration	EN 14414-D (MOD)	TENSILE STRENGTH RETAINED 93% (MD), 93% (CMD) RESULT - PASS
	Chemical Resistance - NAPHTHALENE - 100% Saturated Concentration	EN 14414-D (MOD)	TENSILE STRENGTH RETAINED 101% (MD), 93% (CMD) RESULT - PASS
	Chemical Resistance - HEXANE - 100% Saturated Concentration	EN 14414-D (MOD)	TENSILE STRENGTH RETAINED 99% (MD), 104% (CMD) RESULT - PASS



JUTA UK

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

Jointing and Sealing

GP® TITANFLEX® can be heat welded or taped, with jointing carried out by competent personnel with suitable qualifications in accordance with best practice. GP® TITANFLEX® should be overlapped by at least 100mm. If taping joints, only suitable tape must be used, ensuring application with a silicone roller to remove trapped air. JUTA pre-formed details, or self adhesive gas membrane are available for sealing around protuberances.

Accessory Products

- GP® DPC
- GP® Tape
- GP® Self Adhesive Membrane (SAM)
- GP® Primer
- GP® Top Hats and Preformed Corners
- GP® Protection Fleece
- GP® Void Vent (24/40mm)



GP® TITAN TAPE

GP® TITAN TAPE is an extruded butyl tape designed for jointing GP® TITANTECH® barriers and structural waterproofing barriers. The GP® TITAN TAPE is double sided, with release film on both sides to assist with ease of installation. GP® TITAN TAPE is designed to prevent the passage of water, water vapour, air and gas, for use in building construction with waterproof membranes, vapour control layers and ground gas barriers.

Thickness	1.5 mm
Width	100 mm
Length	15 m

TITANTECH®

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

GP® TITAN TAPE has excellent adhesion to all JUTA membranes, and a wide range of substrates. The flexible composition of the GP® TITAN TAPE makes it highly conformable to irregular surfaces, and it is easy and accurate to use with little to no waste. GP® TITAN TAPE has unrivalled levels of adhesion and is designed to remain flexible throughout the service life.

Application

Application temperature range is +5 to +40°C. Prior to application, all surfaces should be clean, dry and free from frost, grease and loose detritus materials. Apply direct from the reel onto the surface and press along the whole application length to achieve optimal adhesion. Remove the backing paper and offer the opposite surface to the GP® TITAN TAPE and press firmly to seal the joints. JUTA recommends the use of a silicon roller for optimal pressure application to taped joints.





Feature	Characteristics	Test Method	GP® TITAN TAPE
Physical Properties	Thickness	EN 1849-2	1.5 mm
	Width	EN 1849-2	100 mm
	Length	EN 1849-2	15 m
	Packaging	4 rolls/box (50 boxes/pallet)	
	Colour	Black	
Mechanical Properties	Dynamic Tensile Adhesion	Modified PSTC	19 N/cm ²
	Dynamic Shear Adhesion	Modified PSTC	13 N/cm ²
	T-Peel Adhesion to PE Membrane	Modified PSTC	12 N/cm
	Specific Gravity	EN ISO 10563	1.6 g/cm ³
	Moisture Vapour Transmission Rate	EN ISO 15106	0.16 g/m ² /24hr/mm
	Water Tightness (200 kPa) PE Membrane Joint	EN 1928 (MOD)	PASS
	Service Temperature Range	-	-40 to +90 °C
	Radon Transmittance	SP 3873	1.7 x 10 ⁻⁸ m/s

JUTA UK

Please contact JUTA
UK Directly for more
information on GP®
TITAN TAPE

Storage

GP® TITAN TAPE has a shelf life of approximately 24 months when stored flat in original packaging in cool dry conditions.

Compatibility

GP® TAPE is compatible with our full range of waterproof and gas barriers, including:

- GP®1
- GP®2
- GP®H (SAM)
- GP® TITANFLEX®
- GP® Top Hats and Preformed Corners

PD1700

JUTA PD1700 include a high compressive strength Cusate High Density Polyethylene (HDPE) Drainage core with a geotextile filter geotextile bonded to one side. Protection Drainage (PD) 1700 is designed as a high flow medium to alleviate hydrostatic pressure on below ground structures, as well as providing protection to the underlying membrane (gas/waterproofing).

Thickness	8.0 mm
Width	2.0 m
Length	20 m
Weight	620 g/m ²

TITANTECH®

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

Application

JUTA PD1700 is primarily used for external tanking applications, forming a high compressive strength void, providing a path of least resistance for water, which enables controlled drainage into outlets or connector pies. PD1700 can be used in combination with GP gas/waterproofing barriers to provide both protection and drainage for external tanking application, ensuring gas/waterproofing barrier remains intact and the system performs as intended.

Features and Benefits

Optimised for maximum strength and performance, providing high levels of flow. Complies with the latest codes of practice as published by BS, BRE and CIRIA, and certified to EN13252: Drainage systems. PD1700 is independently tested and verified by UKAS accredited bodies. As CSSW qualified manufacturer, JUTA has the right solutions, optimised for market demands.



Feature	Characteristics	Test Method	PD1700
Mechanical Properties	CBR Puncture Resistance	EN ISO 12236	1700 N
	Tensile Strength (MD/CMD)	EN ISO 10319	14 kN/m
	Tensile Elongation (MD/CMD)	EN ISO 10319	100%
	Compressive Strength	EN ISO 25619	140 kPa
Hydraulic Properties	Pore size (O_{90})	EN ISO 12956	90 μ m
	Permeability (H_{50})	EN ISO 11058	79 l/m ² /s
	In plane water flow	EN ISO 12958	1.83 l/s/m width i = 1.0 @ 20 kPa
	(Hard/soft) platens		1.69 l/s/m width i = 1.0 @ 100 kPa
	(To simulate soil action)		1.53 l/s/m width i = 1.0 @ 200 kPa
	(i) Hydraulic gradient		0.49 l/s/m width i = 0.1 @ 20 kPa
	(i) = 1 simulates vertical application		0.45 l/s/m width i = 0.1 @ 100 kPa
	(i) = 0.1 simulates slope application		0.45 l/s/m width i = 0.1 @ 200 kPa
Physical Properties	Mass per unit area	EN ISO 9864	620 g/m ²
	Thickness	EN ISO 9863-1	8.00 mm
Material Dimensions	Roll Width		2.00 m
	Roll Length		20 m
	Gross roll weight		30 kg

JUTA UK

Please contact JUTA
UK Directly for more
information on PD1700

Installation

PD1700 should be installed with the geotextile facing the soil/backfill, and the direction of water flow. Rolls can be cut to size on site. PD1700 can be held in place prior to backfilling with DS Butyl tape (50 mm wide), or mechanically fixed in the absence of a gas/waterproofing barrier.

Adjacent rolls can be overlapped using the geotextile, secured with DS Butyl tape (50mm). Roll ends can be connected by simply butting the cusped sheet together.

Connection to land drains/collection pipes is achieved by placement within the slotted areas, or removal of the cusped core and wrapping of geotextile around the pipe. Care must be taken not to damage/cut the geotextile during core removal to facilitate the connection.

Backfilling should proceed with caution to avoid undue stress on the PD1700. Compactive effort should be avoided within the first 100mm of the PD1700.

JUTA UK

Please contact JUTA
UK Directly for more
information on PD1700

Handling

Roll weights can be up to 35kg and hence appropriate equipment is required for unloading and handling.

Storage

PD1700 is supplied in packaging designed to protect the product from damage during handling and storage, and degradation as a result of UV exposure. PD1700 should be kept in the supplied packaging until such time as it is required for installation, and then covered within 2 weeks of installation.



geoNETEX A PP

JUTA geoNETEX A PP (300 TT) is a nonwoven geotextile manufactured from UV stabilised, high tenacity, virgin polypropylene fibres that have been mechanically entangled to provide high strength, high extensibility, high loft and excellent abrasion characteristics.

TITANTECH®

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

Intended for use in separation, filtration and protection functions - JUTA UK's non-woven geotextile range is manufactured from high tenacity virgin polypropylene staple fibres, which have a high resistance to acids, alkalis and most solvents. Polypropylene can be considered as inert acid and alkali attack and is suitable for most geosynthetic applications.

Handling

Roll weights can be 200 kg and hence appropriate equipment is required for unloading and handling e.g. front-end loader, back hoe, forklift (pole truck) or crane.

Storage

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

6 m Roll Dimensions	6 m x 100 m
6 m Roll Weight (600 m²)	200 kg
2 m Roll Dimensions	2 m x 100 m
2 m Roll Weight (200 m²)	60 kg



geoNETEX A PP

Feature	Characteristics	Test Method	geoNETEX A PP
Mechanical Properties	Static Puncture Strength (CBR)	BS EN ISO 12236	3.7 kN (- 10%)
	Mass per Unit Area	EN ISO 9864	300 g/m ² (- 20%)
	Thickness @ 2kPa	BS EN ISO 9863:1	1.25 mm (nominal)
	Push Through Displacement	BS EN ISO 12236	65 mm
	Tensile Strength (MD)	BS EN ISO 10319	24 kN/m (- 10%)
	Tensile Strength (CMD)	BS EN ISO 10319	24 kN/m (- 10%)
	Tensile Elongation (MD)	BS EN ISO 10319	65% (± 20%)
	Tensile Elongation (CMD)	BS EN ISO 10319	75 % (± 20%)
	Dynamic Perforation Test	BS EN ISO 13433	15 mm (+ 3)
Hydraulic Test Data	Apparent Pore Size 90% Finer (O ₉₀)	EN ISO 12956	80 µm (± 20)
	Water Flow	BS EN ISO 11058	60 l/s/m ² (- 15)
Durability Data	Resistance to Weathering (UV)	EN 12224	> 90%
	Resistance to Oxidization (100 years)	EN 12226	> 90%
	Microbiological Resistance	EN 12225	No Loss
	Resistance to Liquids	EN 14030	No Loss
Physical Property Data	Roll Dimensions		6.0 m x 100 m 2.0 m x 100 m
	Approximate Roll Weight	For handling guidance	200 kg (600 m ²) 60 kg (200 m ²)
	Fibre Type	High tenacity virgin polypropylene staple fibre with UV inhibitor.	
	Needle Detection	The product is electronically and manually inspected during manufacture.	

JUTA UK

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



GP® SEALANT

GP® SEALANT is a novel low modulus expansion joint sealant and adhesive, especially formulated to ensure bubble free cure event at very high temperature and humidity climatic conditions. The product displays excellent thixotropy allowing its use even in very large voids.

TITANTECH®

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

It cures by reaction with atmospheric humidity to produce a joint sealant with a 50% joint movement accommodation factor and excellent adhesion on substrates traditionally problematic for PU Sealants, e.g. glass, aluminium, steel, polycarbonate, etc. The extrusion rate and tooling of the sealant remain the same throughout a very wide range of temperature and humidity conditions.

GP® SEALANT is CE certified according to EN 15651-1, and specifically designed for sealing GP® Membranes reinforcement bar (RE-BAR) penetrations, and complex detailing areas such as fillet, tight corner transitions, terminations to concrete panels, facades, metal frames glass and granite materials. GP® SEALANT exhibits excellent chemical resistance and provides a gas/air tight seal when used in accordance with the instructions provided.

Weight	1.45 gr/cm ³
Cure Rate	2.0 - 3.0 mm/day
Adhesion to Concrete	> 20 kg/cm ² > 2 N/mm ²
CE Certified	EN 15651-1





Feature	Characteristics	Test Method	GP® SEALANT
Mechanical Properties	Reaction to Fire	EN ISO 11925-2	CLASS E
	Elastic Recovery (%)	EN ISO 7389	> 70%
	Resistance to Flow (mm)	EN ISO 7390	≤ 3 mm
	Tensile Properties - Secant Modulus @23°C	EN ISO 8339	≤ 0.4 MPa
	Tensile Properties - Secant Modulus @30°C	EN ISO 8339	≤ 0.4 MPa
	Loss of Mass/Volume	EN ISO 10563	≤ 10%
	Specific Weight	ASTM D1475 / DIN53217 / ISO 2811, @20°C	1.45 gr/cm³
	Tack Free Time, @77°F (25°C) & 55% RH		2.5 - 3.5 hours
	Cure Rate		2.0 - 3.0 mm/day
	Service Temperature		-40 to 80°C
	Hardness	ASTM D2240 / DIN 53505 / ISO R868	± 27 Shore A
	Modulus at 100% Elongation	ASTM D412 / EN-ISO-527-3	0.3 N/mm²
	Elongation	ASTM D412 / EN-ISO-527-3	> 700°C
	QUV Accelerated Weathering Test (4hr UV, at 600C (UVB Lamps) & 4hr COND at 500C)	ASTM G53	Passed (> 2000 hrs)
	Thermal Resistance (100 days, 80°C)	EOTA TR011	Passed
	Toxicity		No restrictions after full cure
	Resilience	DIN 52458	> 90%
	Hydrolysis (8% KOH, 15 days @ 50°C)		No elastomeric property change
	HCl (PH=2, 10 days at RT)		No elastomeric property change
	Hydrolysis (H₂O, 30 days cycle 60-100°C)		No elastomeric property change
	Adhesion to Concrete	ASTM D4541	> 20 kg/cm² > 2 N/mm²
	Methane Transmission (1.0mm)	ISO 15105-1	< 42.4 ml/m²/day/atm
	Carbon Dioxide Transmission (1.0mm)	ISO 15105-1	< 221 ml/m²/day/atm
Compliance and Certification	CE Certified - EN165651-1		

JUTA UK

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

Application

Slide the sealant into the applicator gun, cut off the very end of the sealant packaging and fit gun with the nozzle that has been cut to deliver the right bead size (min 5 mm). Extrude the sealant into the joint, or around the RE-BAR penetration ensuring that no air is trapped in the joint. Tooling is recommended immediately after the application of sealant. The ratio width to depth should be 2:1 subject to a minimum depth of 10 mm.

Packaging

600CC sausage, 15 sausages per box - applicator gun provided.
12 month shelf life. Use once opened.



GP[®]1 SAM

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

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

TITANTECH[®]

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

Handling

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

Storage

Rolls of GP[®]1 SAM should be stored on in a cool, dry place, and be protected from exposure to rain, sun, heat and cold temperatures prior to installation. Exposure to sunlight for extended period of time could cause difficulty with removal of the release film.





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

JUTA UK

Please contact JUTA UK Directly for more information on GP[®]1 SAM

Installation

GP[®]1 SAM should be installed in accordance with the product installation guidelines, and in accordance with BS 8485:2015, and/or BS 8102:2009.

It is recommended that GP[®]1 SAM is not applied in temperatures below 10°C, in colder weather the material can be warmed slightly to aid adhesion.

Accessory Products

- GP[®] Primer
- GP[®] Protection Board
- GP[®] Protection Fleece

GROUND GAS PROTECTION

GP® CRYSTALLINE ACTIVE
BARRIER FLEX 2C
TECHNICAL DATA
SHEET

JUTA



TITANTECH®



**GP®
CAB
FLEX 2C**

Two component cementitious/polymer sealing slurry -
(Fast drying, hydrophobic, waterproof).

GP® Crystalline Active Barrier (CAB) Flex 2C is a two component, fast drying grey waterproofing coating system. The A component is a cement-based powder and B component is a liquid polymer. Due to the polymer the coating system is semi flexible. CAB Flex 2C migrates into the substrate and seals the pores of the substrate to achieve excellent bonding to the surface. It is shrinkage compensated and has quick strength development. CAB Flex 2C also has very good abrasion resistance on the substrate.

Features

- Dry mortar
- EN 1504-3 – Class 3 repair mortar barrier
- Watertight against pressurized water (50 bar, depend on surface)
- Frost resistant
- High compressive strength
- Capillary blocking
- Low consumption
- Easy application
- Sprayable
- Suitable as Pile head/Cap sealing

Colour

Grey

Delivery Form

33 kg units
(25 kg comp. A
+ 8 kg comp. B)

Accordance

EN 1504-3 -
Class 3 repair
mortar barrier

TITANTECH®

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



**GROUND GAS
PROTECTION**

GP® CRYSTALLINE ACTIVE
BARRIER FLEX 2C
TECHNICAL DATA
SHEET



GP®
CAB
FLEX 2C

Feature	Characteristics	GP® Crystalline Active Barrier (CAB) Flex 2C
Physical Properties	Base component A	Cement, quartz sand, additives
	Base component B	Rubber dispersion, additives
	Colour	Grey
	Processing temperature	+ 5°C up to + 35°C
	Bulk density component A	Approx. 1.6 g/cm ³
	Density component B	Approx. 1,01 g/ml Page 2
Properties	Water vapour diffusion resistance factor μ	Approx. 65
	Trafficable	After approx. 4-6 hours
	Loadable	After approx. 3 days
	Applicable	Approx. 45 minutes at 20°C/50% rel. h.
	Curing time	After approx. 48 hours
	Complete curing	After 28 days
	Shrinkage	<0.02%
	Consumption	2.0mm approx. 3 - 3.5 kg/m ²
		2.5mm approx. 3.5 - 5 kg/m ²
	Minimum thickness	Approx. 2 mm where no pressurised water
		Approx. 2.5 mm where anticipating pressurised water
	Compressive strength	Class R3 (>25 MPa)
	Chloride ion content	< 0.05 %
	Adhesive bond	> 1.0 MPa
	Elastic modulus	> 10 GPa
	Capillary absorption	$\leq 0.5 \text{ kg/m}^2 \times h \text{ 0.5}$
	Reaction to fire	Class A1

JUTA UK

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

Application areas

CAB Flex 2C is used for reliable and permanent waterproofing against pressurised water on positive side (outside) as well as on negative side (inside) of buildings. CAB Flex 2C can be used on vertical and on horizontal surfaces to be waterproofed. It is applicable on nearly all mineral sufficiently solid surfaces with an ideal strength of >1.5 N/mm². Typical application areas are basements, concrete elements, car parking, tunnels, water tanks, wet rooms, or manholes. CAB Flex 2C is also usable as waterproofing under walls, and across pile heads/caps against rising dampness.

Delivery form

33 kg units (25 kg comp. A + 8 kg comp. B).

Storage

6 months (frost-free and dry, +5°C up to +25°C in original packaging).



GROUND GAS PROTECTION

GP® CRYSTALLINE ACTIVE
BARRIER FLEX 2C
TECHNICAL DATA
SHEET



GP® CAB FLEX 2C

Application - Surface preparation

The surface must be dry or slightly damp, sound, absorbent and clean. Bonding inhibiting agents such as grease, oil, formwork oil and all loose particles and dust must be removed before application of CAB Flex 2C. Damaged area like cracks, holes or cavities must be reprofiled. Cavities or surface damages >5mm must be reprofiled. The pores of substrate must be open, so CAB Flex 2C can penetrate. Dusty or salt damaged surface must be treated with Deep Primer prior application of the slurry so the substrate is re-solidified and salts are transferred from soluble to insoluble and during curing time of the slurry no salts can penetrate into the CAB Flex 2C during curing.

JUTA UK

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

Application - Negative/ Positive side waterproofing

CAB Flex 2C must be mixed with using of a slow speed mixer in the designed mixing ration (25 kg by 8 kg). Put component B (please shake it before using) in a mixer (or container provided) and add the whole bag of sealing slurry (component A), mix it until a lump-free compound is attained. After mixing wait 1 minute and mix again. The application on the surface must be done with a hard brush or spraying device. The coating in principle is done by minimum 2 layers, whereby the minimum thickness has to be observed. The first layer must not be completely cured before the second layer is applied or the surface has to be pre-wetted.

The whole system has to be secured against over fast drying (wind, sun etc.), frost and rain. At negative side waterproofing the rel. air humidity should not be higher than 65%. CAB Flex 2C can be covered with coating for water vapor diffusion or plasters.

Recommended tools.

- Hard brush
- Roller
- Gloves
- Safety glasses
- Mixer
- Spraying device



GP®5

GP®5 gas barrier is a multi-layer composite of virgin polyethylene (PE) giving exceptional resistance to the passage of ground gas and organic vapours. It also acts as a high performance DPM.

Thickness	0.4 mm
Width	Various m
Length	Various m
Weight	400 g/m ²

TITANTECH®

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

GP®5 is suitable for the following applications:

- Carbon dioxide and methane affected sites in accordance with BS 8485:2015 + A1:2019 & NHBC
- Radon affected sites in accordance with BRE211:2015
- Damp protection in accordance with Building Regulations Part C
- Low level VOC contaminated sites (site specific assessment required)

Handling

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

Installation

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





Feature	Characteristics	Test Method	GP [®] 5
Physical Properties	Thickness	EN 1849-2	0.4 mm
	Width	EN 1849-2	Various m
	Length	EN 1849-2	Various m
	Weight	EN 1849-2	400 g/m ²
Hydraulic Press	Resistance to Water Penetration	EN 1928 (A)	Pass
Mechanical Properties	Resistance to Static Load	EN 12730	> 20 kg
	Tensile Strength (MD)	EN 12311-2 (A)	> 300 N/50mm
	Tensile Strength (CMD)	EN 12311-2 (A)	> 300 N/50mm
	Resistance to Tearing (Nail Shank) MD	EN 12310-1	> 230 N
	Resistance to Tearing (Nail Shank) CMD	EN 12310-1	> 230 N
	Impact Resistance	EN 12691-B	500 mm
	Puncture Resistance	ASTM D 4833	> 160 N
	Puncture Resistance	EN 12236	1.60 kN
	Reaction to Fire	EN 13501-1	E
Vapour Permeability	Methane Permeability	BS EN ISO 15105-1	0.12 ml/m ² /day/atm
	Carbon Dioxide Permeability	BS EN ISO 15105-1	1.53 ml/m ² /day/atm
	Hydrogen Permeability	BS EN ISO 15105-1	68.7 ml/m ² /day/atm
	Benzene Permeability	BS EN ISO 15105-2	0.41 ml/m ² /day
	Oxygen Permeability	BS EN ISO 15105-2	<3 ml/m ² /day
	Radon Permeability	K124/02/95	1.0 x 10 ⁻¹² m ² /s
Fuel Vapour Permeability	Petrol	BS EN ISO 15105-2	(ave.) 3.4 x 10 ⁻¹³ /mol/(m ² .s.Pa)
	Diesel	BS EN ISO 15105-2	(ave.) 3.4 x 10 ⁻¹³ /mol/(m ² .s.Pa)
Durability	Durability Watertightness After Artificial Ageing	EN 1928	Pass
	Durability Watertightness Against Chemicals	EN 1928	Pass
Compliance and Certification	CE Mark - EN 13967:2012		
	NHBC Standards Compliant		
	BS 8485:2015 + A1 2019 Accordant		

JUTA UK

Please contact JUTA
UK Directly for more
information on GP[®]5

Storage

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



JUTA UK

Please contact JUTA
UK Directly for more
information on GP[®]5

Jointing and Sealing

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

Accessory Products

- GP[®] DPC
- GP[®] Tape
- GP[®] Self Adhesive Membrane (SAM)
- GP[®] Primer
- GP[®] Top Hats and Preformed Corners
- GP[®] Protection Fleece
- GP[®] Void Vent (24/40mm)



GP® LIQUID BARRIER

GP® LIQUID BARRIER is a multi-use synthetic rubber-based gas-proofing and waterproofing system. It can be specified as a liquid gas proof barrier, a damp/waterproof membrane or both dependent on the project requirement. The product is an elastic, UV-resistant, single component system supplied in red.

TITANTECH®

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

GP® LIQUID BARRIER is a water-based non-hazardous product, safe and easy to apply direct from the packaging using a roller, brush or airless spray. The product can be applied to dry or damp substrates and dries in approximately one hour to form a tough semi-gloss finish.

Features

- Rapid drying
- Methane and Carbon Dioxide barrier
- Dual-use Damp/Waterproof and gas barrier
- Damp surface tolerant
- Non-toxic
- Excellent bonding strength to common construction substrates
- Good crack-bridging properties
- Resistant to weak mineral acids
- Good Alkali and brine solution resistance

Density	1.5-1.6 g/cm ³ at 20°C
Form Supplied	Viscous Liquid
Pack Size	8 kg / 15 kg (Bespoke sizes available on request)
Colour	Red

Named accessory in



Certifications





Feature	Characteristics	Test Method	GP® LIQUID BARRIER
Physical Properties	Density		1.5-1.6 g/cm ³ at 20°C
	Form Supplied		Viscous Liquid
	Pack Size		8 kg / 15 kg (Bespoke sizes available on request)
	Colour		Red
	Shelf Life		18 months (unopened)
	Odour		Latex (Vanilla)
	Drying Time		1 hour at 20°C
Permeability*	Water Vapour Permeability		< 0.5 g/m ² /day
	Methane Permeability	EN ISO 15105-1	< 28.8 ml/m ² /day/atm
	Carbon Dioxide permeability	EN ISO 15105-1	< 267 ml/m ² /day/atm
	Radon Permeability	K124/02/95	< 9.5 x 10 ⁻¹² m ² /s
Hydraulic Properties	Water Tightness (60 kPa)	EN 1928	PASS (Watertight at 0.6mm thick)
Properties	Adhesion to concrete		> 1.1 N/mm ²
	Static Crack Bridging Ability	BS EN 1062-7 - A	CLASS A5 (> 2.5mm)
	Dynamic Crack Bridging Ability	BS EN 1062-7 - B4.2	No failure - 0.5mm - 20,000 cycles
	Chemical Resistance	BS EN 13529:2003	Resistant to a range of chemicals
	Elongation	ASTM D2370	> 100%
	Dry Film Thickness (DFT)		600 - 1000 µm (2-coats) 600µm - Brush/roller application 1000µm - Airless spray application

*Permeability values based on min. 0.6mm thick.

JUTA UK

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

Uses

- Methane, Carbon Dioxide and hydrocarbon vapour suppression
- Seamless liquid-based gas proofing solution
- Waterproofing and gas suppression at ground floor level, basements and subterranean structures
- Tanking applications, retaining walls etc.
- Bunding applications (please verify chemical resistance prior to specification)
- Can be applied under tiled areas for secondary protection in wet areas
- Repairs of floor surfaces; can be applied as a base coat on a damaged surface before application of a self-levelling thin section screed (compatible with latex or cementitious)
- Concrete roof protection
- Silage and sewage tank lining
- Barrier to water vapour for brickwork, blockwork and stonework



JUTA UK

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

Application

All surfaces should be smooth, clean, dry, sound and free from frost, oil, grease, condensation and other contamination. Remove any organic growth with a fungicidal wash as may be necessary.

Non-structural cracks, less than 0.5mm, must be filled. Structural cracks must be first repaired and filled. Fill holes and re-point flush to the finish using a cementitious repair mortar.

Newly laid concrete should have a clean textured surface, internal angles should be filleted with a 45° fillet using a suitable cementitious mortar. For expansion joints, ensure that the product is applied well into the rebate before the expansion media is applied. Other gas membranes must be exposed and lapped with where present.

The minimum ambient temperature for application is 5°C, it is not recommended to apply the product at temperatures below this as specified drying times will not be achieved.

No priming is necessary with this product. To assure that the product fully wets out the substrate the surface may be dampened. There should not be any standing water or soaking.

Product is recommended to be brush, roller or airless spray applied, avoid pouring directly onto a horizontal surface. This may cause puddling during application and increase drying time. Stir the product well for 2 minutes before use.

Should the product require thinning, it is recommended to thin 5% by volume of water initially and evaluate the resulting viscosity. The product should not need to be thinned in normal conditions of storage and use.

Coverage

For a dry film thickness of 0.6mm then apply at 0.85kg/m² per coat (1.7kg/m² per 2-coat system). For the application of a dry film thickness of >0.3mm in a single coat it is recommended that the membrane is applied by airless spray. Using airless spray, a single application dry coat thickness up to 1mm may be attained.

The product can be applied as a single coat in certain applications but two coats is universally recommended. Recommended coating thickness is 300µm (0.3mm) per coat and 600µm (0.6mm) for the overall membrane thickness for best performance. Thicker applied coatings will require greater drying time. Performance is improved where the second coat is applied at right angles to the first but it is not essential to do so. Leave 90-120 minutes before overcoating with the second coat, a touch dry test on the first coat will indicate readiness. It is recommended that the second coat is applied within 24 hours of the first coat. Full cure of the membrane is 48 hours after the second coat application.



JUTA UK

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

Concrete Roofing Applications

Blistering may occur if application is not undertaken as recommended. Blistering results from heat from the sun causing a vapour pressure build below the membrane. This is more likely to occur if the concrete surface is wet so it is recommended for this particular application that the substrate is dry. Ensuring a good bond to the substrate is essential; vigorously brush the first coat into the concrete using a stiff bristled broom. So far as possible avoid application of the membrane on a day with strong, direct sunlight (overcast but dry is ideal). To enhance bonding it may be necessary to prime the roof with a slurry of screeding latex and cement if the original surface condition is poor.

Considerations

It is always advisable to check product compatibility and adhesion by testing on a sample area before starting any sizeable project.

Do not apply if rain is forecast before product can fully dry.

Exercise caution on coating thickness, exceeding recommended coverage rates increases probability of cracking and splitting.

Do not apply this product over bituminous surfaces.

Spray: For further application information please consult the Technical Department.

For cleaning tools use water immediately after use.

Regulatory

All components are REACH (Reg. (EC) No 1907/2006) registered. The product does not contain any Substances of Very High Concern (SVHC).

When designing Type A structures (as classified in BS 8102: 2009), the product, applied correctly, is capable of providing the levels of protection required for Grades 1, 2 & 3 basements.

Toxicity and Safety

Product is not classified as hazardous according to the CLP Regulation (Reg. (EC) No 1272/2008). Refer to the Product Safety Data Sheet for specific information.

Handling and Storage

Store in cool, dry conditions in the original manufacturer packaging. The product has a 18-month shelf life provided the container is unopened. If opened the product should be used within 1 month and sealed air-tight between uses. Longer storage times may result in fillers falling to the base of the container, rigorous and thorough stirring is recommended prior to application.

Appendix C

GAS PROTECTION MEASURES VERIFICATION VISUAL INSPECTION RECORD



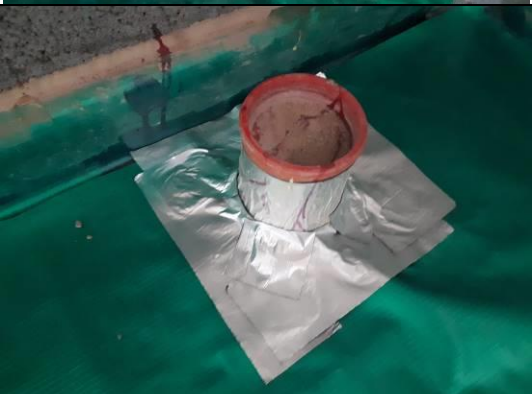
Site Name:		Gas Characteristic Situation:	
Job Number:		Type of development: (Residential/ commercial/ other)	
Date:		Building Description:	
Verification Engineer:		Foundation Type: (suspended floor/ raft/ other)	
Weather during inspection:		Gas Protection Type: (passive/ active)	
Plot number(s):			

The box below should be used to present a sketch plan of the building/plot layout, showing locations of all key features of the gas protection system and installation (vents, joins, seals, service penetrations etc). All relative inspection details/comments should be recorded in the table below.

No.	Item	Comments (see notes)
1 - Passive Venting		
1.1	Sub-floor void	Exceeds minimum 200mm (typically >250mm) clear subfloor void beneath plot and garage, no significant obstructions identified.
1.2	External wall airbricks	Adequate number of airbricks on all four external walls, no obstructions.
1.3	Internal sleeper walls	Sleeper wall ventilation included although not required due to adequate front to rear external vents.
1.4	External vent trenches/ ducts	Telescopic vents in place, correctly aligned across cavity with airbricks to provide free flow of air to subfloor void. No obstructions identified.
2 - Active Venting		
2.1	Active venting System details	N/A

No.	Item	Comments (see notes)
3 - Gas Membrane		
3.1	Condition of sub-grade and underside of membrane	Generally acceptable, swept clean prior to membrane placement, although still significant dust present in places.
3.2	Details of gas membrane product used	Fosroc Proofex Total Membrane Installers used green and silver Proofex Total in Plot 3. In Plot 2 an older version of Proofex membrane was used which was black and silver. IDG checked the roll and confirmed the specifications to be identical. Batch number/Manufacture time/date unknown.
3.3	Gas membrane condition (rips/ tears/ penetrations)	Generally very good. No punctures/rips or tears identified.
3.4	Details of joining/ lapping tape products used	Fosroc Proofex Double Sided Butyl Jointing tape 50mm Fosroc Proofex 3000MR Self Adhesive Membrane
3.5	Lapping design	Overlaps adequate (meet min. 150mm recommended by manufacturer).
3.6	Laps, welds and joint seals	All joints and seams completed to sufficient standard with both Fosroc Proofex Double Sided Butyl Jointing tape and Fosroc Proofex 3000MR Self Adhesive Membrane. Proven by air lancing.
3.7	Service entry seals	All Top Hat seals installed to a high standard using Fosroc Proofex 3000MR Self Adhesive Membrane.
4 – Other comments/ considerations		
4.1		
4.2		
5 - Photographs		
Photograph		Description
		Photograph showing the beam and block floor on Plots 2 & 3 complete, including attached garages. Minimum 200mm void verified beneath floor.
		Photograph showing clear void of minimum 200mm height beneath the beam and block floor on Plots 2 & 3.

	Photograph showing external Airbricks connected to telescopic vents on Plots 2 & 3.
	Photograph showing first fit gas membrane in place on Plots 2 & 3. Continuous across external cavity walls and internal walls, with appropriate corner/ doorway threshold detailing tape.
	Photograph showing sealing around service entry points utilising Fosroc 3000MR self-adhesive membrane on Plots 2 & 3.
	Photograph showing gas membrane in place on Plots 2 & 3 with all joints lapped and welded. Tophat fittings visible.

	Photograph showing gas membrane in place on Plots 2 & 3 with all joints lapped and welded. Tophat fittings visible.
	Photographs showing membrane join with min. 150mm overlap of membrane on Plots 2 & 3.
	Photograph showing sealing around service entry points utilising Fosroc 3000MR self-adhesive membrane on Plots 2 & 3.
	Photograph showing sealing around service entry points utilising Fosroc 3000MR self-adhesive membrane on Plots 2 & 3.

REMEDIAL ACTIONS REQUIRED

N/A

CERTIFICATION

The visual verification inspection was undertaken by a suitably competent IDG verification engineer, in accordance with the requirements of CIRIA C735 and the site-specific Gas Protection Measures Verification Plan.

The Gas Protection Measures for PLOTS _____:	A) Are acceptable and comply with the specification. <i>Final Certification of this Plot is subject to successful Air Lance Integrity Testing to demonstrate compliance.</i>	✓
	B) Are acceptable and comply with the specification. <i>Integrity Testing is not required for this plot.</i>	
	C) Are acceptable but attention is drawn to issues relating to item(s) No.	
	D) Are not acceptable due to issues requiring remedial action as indicated above. <i>This plot should be re-inspected and verified upon completion of any required remedial works.</i>	
NAME	SIGNATURE	DATE
****	*****	****

Inspection Checklist Notes:

1.1	Sub-floor void	Is a check possible? Void former? Gravel (type/ specification)? Height of void space? Is it clear?
1.2	External wall airbricks	Numbers, size, positions as per design drawing?
1.3	Internal sleeper walls	Ventilation holes (honeycomb brickwork/ pipe crossings)? Size, spacing, location in accordance with design?
1.4	External vent trenches/ ducts	Located/ construction in accordance with design? If open-topped – gravel type, presence of fines? If pipe or other vent, check position and construction for functionality and absence of blockages. Ability of void former to withstand bearing of superstructure?
2.1	System details	Type of air supply: mechanical, natural, combined? Location/ condition/ number of fans and vents? Location and size of inlets? Provision of air-cleaning devices? Supply and exhaust ducting? Alarm provision/ installation? Gas monitoring system in under-floor void?
3.1	Condition of sub-grade and underside of membrane	Check that the sub-grade does not contain rough/uneven surfaces, is appropriately clean and that there are no hard/sharp objects. That protective sand blinding or geotextile (if specified) is present?
3.2	Details of gas membrane product used	Manufacturer and product specification, gauge, colour, brand/name, material, batch/ roll numbers, storage arrangements (to protect from dirt/damage).
3.3	Gas membrane condition (rips/ tears/ penetrations)	Open punctures, tears, rips, stretching? Excessive footprints/ evidence of traffic? Presence of debris? Repairs? Signs of weakness such as raised or sunken indentations? Protection plan in place to restrict access to lain gas membrane?
3.4	Details of joining/ lapping tape products used	Product type, brand, thickness, material, width, colour? Foil backed? Double sided?
3.5	Lapping design	Joints lapped and sealed in accordance with manufacturers requirements/ specification? Minimum overlap ensured? Sections taped twice (double sided and lapping)?
3.6	Laps, welds and joint seals	Welds complete? Appropriate jointing tape used? No creases or folds in sheet edges? Adequately bonded? (confirm by air lance integrity testing as necessary in accordance with the verification plan)
3.7	Service entry seals	Top hats seal arrangements fixed around service entries? Use of jubilee clips? Adequately taped to membrane at joins with double-sided and lapping tape?

Appendix D

GAS PROTECTION MEASURES VERIFICATION AIR LANCE INTEGRITY TESTING RECORD



Site Name:		Gas Characteristic Situation:	
Job Number:		Type of development: (Residential/ commercial/ other)	
Date:		Building Description:	
Integrity Testing Engineer:		Foundation Type: (suspended floor/ raft/ other)	
Weather during inspection:		Gas Protection Type: (passive/ active)	
Plot number(s):			

ASTM D4437-08:2013 Air Lance Test—Inspect all seams for unbonded areas using an air nozzle directed on the upper seam edge and surface to detect loose edges, ripples indicating unbonded areas within the seam, or other undesirable seam conditions. Check all bonded seams using a minimum 50 psi (345 kPa) (gage) air supply directed through a $\frac{3}{16}$ in. (4.8 mm) (typical) nozzle, held not more than 2 in. (51 mm) from the seam edge and directed at the seam edge.

The box below should be used to present a sketch plan of the building/plot layout and membrane, showing locations of all key joints and seal features of the gas protection system and installation which are subject to air-lance integrity testing (joints, seals, tophats around service penetrations etc).

- Failure points in seams or joints should be marked sequentially 'F₁', 'F₂' etc with approximate dimensions.
- Seams and joints deemed to be satisfactory should be marked with an S. All relative testing details/comments should be recorded in the table below.

Report Reference *****

4 - Photographs	
Photograph	Description
	IDG's typical Air lance kit set up for integrity testing of the seams/ joins and tophat seals, and compliant with ASTM D4437.
	Air lance testing of joint between two membrane sheets on Plots 2 and 3, with pressure gauge showing maintained pressure of 57psi. (Above minimum of 60psi advocated by ASTM D4437-08:2013).
	Air lance testing of joint between two membrane sheets on Plots 2 and 3, with pressure gauge showing maintained pressure of 60psi. (Above minimum of 50psi advocated by ASTM D4437-08:2013).
	Air lance testing of joint between gas membrane and Tophat at service penetration on Plots 2 and 3 with pressure gauge showing maintained pressure of 57psi. (Above minimum of 50psi advocated by ASTM D4437-08:2013).

REMEDIAL ACTIONS REQUIRED

N/A

CERTIFICATION

The air lance integrity testing was undertaken by a suitably competent IDG testing engineer, using specialist equipment designed to comply with the requirements of ASTM D4437-08:2013, and the site-specific Gas Protection Measures Verification Plan.

The Gas Protection Measures for PLOTS _____:	A) Have passed both the visual verification inspection and air lance non-destructive integrity testing of all seams and joins. The quality of installation and workmanship are satisfactory and comply with the specification.	✓
	B) Are acceptable but attention is drawn to issues relating to item(s) No.	
	C) Are not acceptable due to issues requiring remedial action as indicated above. <i>This plot should be re-inspected and verified upon completion of any required remedial works.</i>	
NAME	SIGNATURE	DATE
*****	*****	*****

Appendix E

BRANDON RICE-BIRCHALL
I D GEO ENVIRONMENTAL LTD
CALEDONIAN HOUSE
TATTON STREET
KNUTSFORD
WA16 6AG

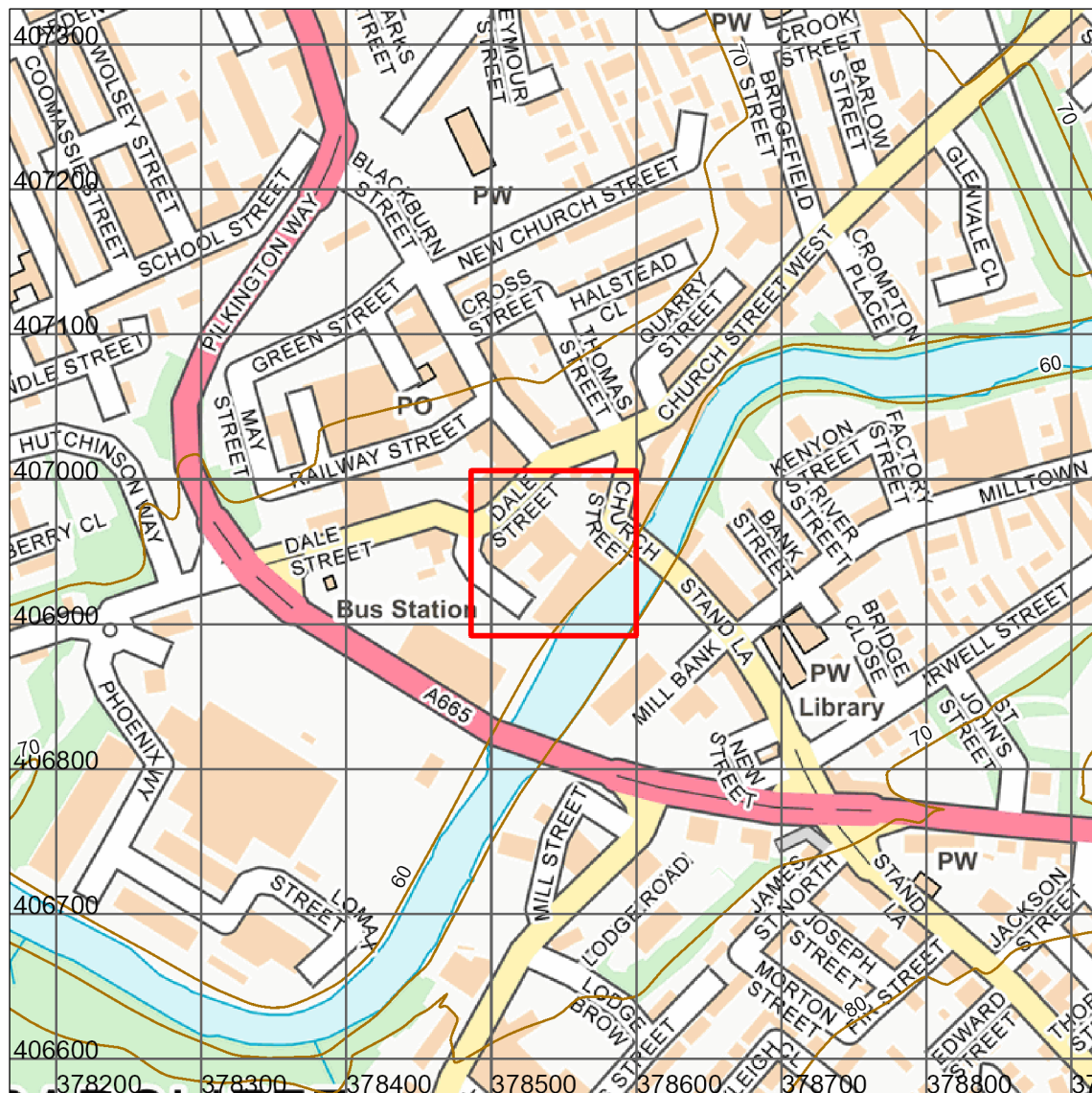
Radon Report

Advisory report on the requirement for radon protective measures in new buildings, conversions and extensions to existing buildings. The report also indicates whether a site is located within a radon Affected Area

Report Id: *BGS_332484/44389*

Client reference: 5238

Search location



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Search location indicated in red

*This report describes a site located at National Grid Reference 378543, 406949.
Note that for sites of irregular shape, this point may lie outside the site boundary.
Where the client has submitted a site plan the assessment will be based on the area given.*

Radon Report: UK

When extensions are made to existing buildings in high radon areas, or new buildings are constructed in these areas, the Building Regulations for England, Wales, Scotland and Northern Ireland require that protective measures are taken against radon entering the building.

This report provides information on whether radon protective measures are required. Depending on the probability of buildings having high radon levels, the Regulations may require either:

1. No protective measures
2. Basic protective measures
3. Full protective measures

This is an advisory report on the requirement for radon protective measures in new buildings, conversions and extensions. The report also indicates whether a site is located within a radon Affected Area

Requirement for radon protective measures

The determination below follows advice in *BR211 Radon: Guidance on protective measures for new buildings (2015 edition)*, which also provides guidance on what to do if the result indicates that protective measures are required.

Is the property in an area where radon protective measures are required for new buildings or extensions to existing ones as described in publication BR211 (2015 edition) Radon: Guidance on protective measures for new buildings?

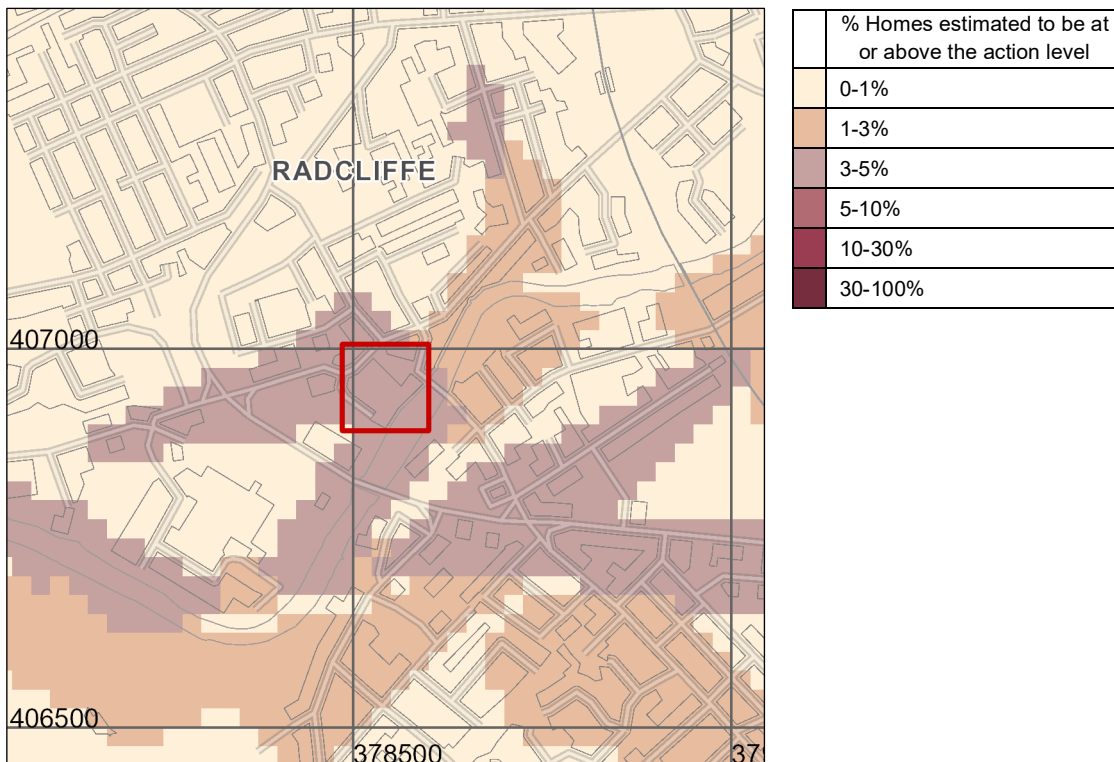
BASIC RADON PROTECTIVE MEASURES ARE REQUIRED FOR THE REPORT AREA.

More details of the protective measures required are available in *BR211 Radon: Guidance on protective measures for new buildings (2015 Edition)*. Additional information and guidance is available from the Building Research Establishment website (<http://www.bre.co.uk/radon/>).

Whether or not the radon level in a building is above or below the radon Action Level can only be established by having the building tested. The UKHSA provides a radon testing service which can be accessed at www.ukradon.org or by telephone (01235 822622).

If you require further information or guidance, you should contact your local authority building control officer or approved inspector.

Radon Affected Area



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Scale: 1:10 000 (1cm = 100 m)

Search area indicated in red

Is the property in a radon Affected Area as defined by the UK Health Security Agency (UKHSA) and if so what percentage of homes are estimated to be at or above the Action Level? YES

Additional Information

THE PROPERTY IS IN A RADON AFFECTED AREA WHERE 3 TO 5% OF HOMES ARE ESTIMATED TO BE AT OR ABOVE THE ACTION LEVEL.

The UKHSA recommends a radon 'Action Level' of 200 Becquerels per cubic metre of air (Bq m^{-3}) for the annual average of the radon gas concentration in a home. Where 1% or more of homes are estimated to be at or above the Action Level the area should be regarded as a radon Affected Area.

This report informs you whether the property is in a radon Affected Area and the percentage of homes that are estimated to be at or above the radon Action Level at this location. Being in an Affected Area does not necessarily mean there is a high radon level within the property; the only way to determine the radon level is to carry out a radon measurement.

The UKHSA advises that radon gas should be measured in all properties within radon Affected Areas and that homes with radon levels at or above the Action Level (200 Bq m⁻³) should be remediated. Householders with levels between the Target Level (100 Bq m⁻³) and Action Level should seriously consider reducing their radon level, especially if they are at greater risk, such as if they are current or ex smokers. Whether or not a home is in fact above or below the Action Level or Target Level can only be established by having the building tested. The UKHSA provides a validated radon testing service which can be accessed at www.ukradon.org.

The information in this report provides an answer to one of the standard legal enquiries on house purchase in England and Wales, known as Law Society CON29 Enquiries of the Local Authority (2016); 3.14 Radon Gas: Do records indicate that the property is in a “Radon Affected Area” as identified by the UKHSA. The data can also be used to advise house buyers and sellers in Scotland and Northern Ireland.

If you are buying a new build property in a Radon Affected Area, you should ask the builder whether radon protective measures were incorporated in the construction of the property.

If you are buying a currently occupied property in a radon Affected Area, you should ask the present owner whether radon levels have been measured in the property. If they have, ask whether the results were at or above the radon Action Level and if so, whether remedial measures were installed, radon levels were re-tested, and if the results of re-testing confirmed the effectiveness of the measures.

Further information on radon is available from the UKHSA at www.ukradon.org.

What is radon?

Radon is a naturally occurring radioactive gas, which is produced by the radioactive decay of radium which, in turn, is derived from the radioactive decay of uranium. Uranium is found in small quantities in all soils and rocks, although the amount varies from place to place. Radon released from rocks and soils is quickly diluted in the atmosphere. Concentrations in the open air are normally very low and do not present a hazard. Radon that enters enclosed spaces such as some buildings (particularly basements), caves, mines, and tunnels may reach high concentrations in some circumstances. The construction method and degree of ventilation will influence radon levels in individual buildings. A person's exposure to radon will also vary according to how particular buildings and spaces are used.

Inhalation of the radioactive decay products of radon gas increases the chance of developing lung cancer. If individuals are exposed to high concentrations for significant periods of time, there may be cause for concern. In order to limit the risk to individuals, the Government has adopted an Action Level for radon in homes of 200 becquerels per cubic metre (Bq m^{-3}). The Government advises householders that, where the radon level is at or above the Action Level, measures should be taken to reduce the concentration.

Radon in workplaces

The Ionising Radiation Regulations 2017 require employers to take action when radon is present above a defined level in the workplace. Advice may be obtained from your local Health and Safety Executive Area Office or the Environmental Health Department of your local authority. The BRE publishes a guide (BR293): **Radon in the workplace**. BRE publications may be obtained from the BRE Bookshop, Tel: 01923 664262, email: bookshop@bre.co.uk website: www.brebookshop.com

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