

Head Office

Dane Mill Business Centre,
Broadhurst Lane, Congleton
CW12 1LA
t: 01565 755557
www.id-geo.co.uk

**VERIFICATION OF RADON
GAS PROTECTION MEASURES**

installed at

**RADCLIFFE CIVIC HUB,
RADCLIFFE, MANCHESTER**

Prepared for

VINCI BUILDING LTD

On Behalf of

BURY COUNCIL

Report No. 5238-G-R005

Date: May 2026

TABLE OF CONTENTS

1	GENERAL	1
1.1	The Commission and Brief	1
1.2	Previous Reports	1
1.3	The Development.....	1
1.4	Foundations and Floor Construction	1
2	THE GROUND GAS REGIME AND THE GAS PROTECTION SYSTEM	2
2.1	The Ground Gas Regime.....	2
2.2	Basic Radon Protection System.....	2
2.3	Specification of Gas Protection Measures	3
3	THE INSPECTION & INTEGRITY TESTING REGIME	3
3.1	Requirements and Scope of Inspections and Verification	3
3.2	Inspection Requirements	4
3.3	Independence and Competency of Verifier	4
4	VISUAL INSPECTION/INTEGRITY TESTING PROCEDURE	5
4.1	Independent Visual Inspection Requirements.....	5
4.2	Method of Recording and Reporting Inspections	6
4.3	Requirements and Scope of Integrity Testing.....	6
4.4	Integrity Testing Methodology.....	6
4.5	Elements of Gas Protection Requiring Integrity Testing	7
4.6	Performance Requirements of Integrity Testing	7
4.7	Method of Recording and Reporting Integrity Testing	7
4.8	Non-Independent QA Inspection	8
5	VERIFICATION	8
5.1	Independent Validation Inspection and Testing	8
5.2	Non-Independent QA Inspection Records	8
5.3	Gas Protection Products.....	9
6	VARIATION FROM IMPLEMENTATION PLAN	9
6.1	Variation to Specified Gas Protection Products.....	9
6.2	Minor Design Variation Associated with Change of Product	9
7	ON-GOING DUTY OF CARE AND VERIFICATION	9
8	OUTSTANDING POST-CONSTRUCTION RADON MONITORING.....	10
8.1	Radon Monitoring Requirements	10
9	CONCLUSION	10

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 Protection Measures Materials Technical Information

Appendix C – Radon Protection Measures Inspection and Integrity Testing Certificates

Appendix D – Vinci QA System Information

Appendix E – Additions and Variations Documentation

VERIFICATION OF RADON GAS PROTECTION MEASURES
installed at
RADCLIFFE CIVIC HUB, RADCLIFFE

1 GENERAL

1.1 The Commission and Brief

- 1.1.1 ID Geoenvironmental Limited (IDG), were commissioned by Vinci Building Ltd on behalf of Bury Council (The Client) to prepare a Verification Report for the installation of Radon gas protection measures during the construction of their development at Radcliffe Civic Hub, hereafter referred to as 'the site'. Vinci Building Limited (Vinci) have been appointed by Bury Council as the Design & Build Contractor for the development.
- 1.1.2 The purpose of this document is to satisfy regulators and meet the requirements of CIRIA C735 (Good Practice on the Testing and Verification of Protection Systems for Buildings against Hazardous Ground Gases) by confirming that radon protection measures have been installed, inspected, tested and verified in accordance with the recommendations presented in the Radon Gas Protection Measures Verification Plan 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).
 - Verification Report for the Remediation and Preparatory Works for Land at Radcliffe Civic Hub (Report Ref. 5238-G-R003-Rev A, dated March 2025).
 - Radon Gas Protection Measures Verification Implementation Plan for Radcliffe Civic Hub, Report No. 5238-G-R004, dated August 2024.
 - Radon Gas Protection Measures Verification Implementation Plan for Radcliffe Market Hall Chambers, Report No. 5238-G-R006, dated November 2024.

1.3 The Development

- 1.3.1 The 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 Foundations and Floor Construction

- 1.4.1 The Civic Hub building is constructed with a piled foundation solution.
- 1.4.2 Floor constructions 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 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, revised BS8485:2019, 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 required in the new Civic Hub building, along with post-construction Radon Monitoring to satisfy requirements of the Local Authority and HSE.

2.1.4 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 IDG's Radon Gas Protection Measures Verification Implementation Plan, Report Ref. 5238-G-R004 sets out the requirements of the Gas Protection System, including details of the design, the various gas protection components to be used and the necessary verification objectives. This includes:

- Foundation and Floor Construction Methods.
- The various elements of the gas protection system needed to meet the requirements for a Basic Radon designation.
- The specified component products to be used in the gas protection system.
- The inspection and integrity testing regime
- Verification Requirements

2.2.2 Reference should be made to IDG's Implementation Plan (Report Ref. 5238-G-R004) for full details.

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

2.3 Specification of Gas Protection Measures

2.3.1 The radon protection measures products for installation (as outlined in the agreed Implementation Plan) 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

2.3.2 Details of any variations to the above specified products are documented in Section 6.1 below.

2.3.3 Product specification information for the materials used are presented in Appendix B.

3 THE INSPECTION & INTEGRITY TESTING REGIME

3.1 Requirements and Scope of Inspections and Verification

3.1.1 A number of factors were 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 took into consideration four main factors:

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

3.1.2 IDG's Implementation Plan included a qualitative assessment of the risk presented in order to derive the inspection/testing frequency. The assessment is summarised 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 determined 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.

3.2 Inspection Requirements

- 3.2.1 On the basis of there being a medium to high risk associated with the quality of installation of the gas protection measures, the agreed requirements for inspection and integrity testing of the Radon protection installation 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 Verifier

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 is considered to be a conflict of interest and is not good practice. Verification should 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 were therefore appointed by the client as an independent verification consultant.

Competency

- 3.3.3 In accordance with C735, Annex 1: Table A1 footnote 4; The verification consultant should be competent, experienced and suitably trained.
- 3.3.4 In order to meet these competencies, IDG's Verification Engineers have the following training and experience:

- 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 engineer's 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 required a suitably qualified engineer to visit the site at the earliest opportunity following completion of each element of the gas protection measures.
- 4.1.2 In order to properly inspect the membrane, inspections were undertaken 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.
- 4.1.3 The verification inspections included some or all of the following aspects as appropriate:
- 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 inspection visit, the engineer worked through a number of elements (as above), with notes and comments recorded on a standard proforma worksheet on site. This was written up in a digital format upon return to the office. IDG will keep digital copies of the information for future reference.
- 4.2.2 Following each inspection, the IDG engineer reported back to the Client's site / project manager whilst on site, with recommendations being 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.

4.3 Requirements and Scope of Integrity Testing

- 4.3.1 The required scope of integrity testing required all joints, pipe penetrations, seams and joints to be air lanced to ASTM D4437, in accordance with the requirements of the implementation plan.

4.4 Integrity Testing Methodology

- 4.4.1 Following review of all available guidance, and with consideration of the CSM, and design details, IDG determined that the most appropriate methods of integrity testing to use for the development was a combination of mechanical point stress tests and air lance testing of membrane seams and joins.
- 4.4.2 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.
- 4.4.3 Mechanical Point Stressing was 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.'

- 4.4.4 Air Lance Testing was 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'.

- 4.4.5 IDG utilised 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.

4.5 Elements of Gas Protection Requiring Integrity Testing

- 4.5.1 IDG consider the element of gas membrane installation most commonly found to be unsatisfactory is typically 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.
- 4.5.2 IDG consider that mechanical point stressing and air lance testing allows such weaknesses in the installation to be highlighted quickly and transparently, enabling IDG and the client to advise the installer of the need for any remedial work at the time of inspection.
- 4.5.3 The testing therefore focused on the following aspects where applicable to the specific installation:
- 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 (tophats), internal wall structures, around doorways etc.

4.6 Performance Requirements of Integrity Testing

- 4.6.1 The air lance testing highlighted any areas where the joins or seams were inadequately bonded by an apparent ruffling of the membrane on the internal side of the join where the air flow passes through the join and sealing tape. Where seams are very poorly bonded, the air lance would visibly open up the join.
- 4.6.2 Any locations where this occurs are considered to be an integrity failure, and were recorded on the proforma.
- 4.6.3 Upon completion of the testing, the integrity test engineer reviewed each element with the site manager and/ or installers, and each failure point was highlighted, discussed, and remedial repair requirements were instructed as necessary.
- 4.6.4 Following completion of any required remedial repair works, the joins and seams were re-tested using the same air lance methodology to confirm that any remedial works were successful.
- 4.6.5 Each element/ section of radon protection was not certified until the integrity testing had demonstrated sufficient conformity to the requirements for fully bonded joins and seams, thus ensuring continuity of the gas membrane protection across the area of a block.

4.7 Method of Recording and Reporting Integrity Testing

- 4.7.1 In order to formally record and report the integrity testing, the engineer completed an integrity testing proforma recording relevant diagrams, notes and comments whilst on site. This was written up in a digital format upon return to the office. IDG will keep digital copies of the information for future reference. Reporting is by inclusion in this verification report.

4.8 Non-Independent QA Inspection

- 4.8.1 Whilst IDG provided 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) carried out their own QA inspections and produced bespoke QA records for the radon protection measures.
- 4.8.2 In addition, QA records completed by the installers (SEL Environmental Ltd) were 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 is largely supplementary to IDG's independent verification, and serves to provide additional information, records and confidence throughout the installation.
- 4.8.5 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 was determined satisfactory that small simple sections of the gas protection installation or minor remedial works could be documented via non-independent QA verification subject to review by IDG.

5 VERIFICATION

5.1 Independent Validation Inspection and Testing

- 5.1.1 Suitably qualified IDG validation engineers visited the site on multiple occasions between July 2024 and February 2026 to inspect and integrity test the hazardous ground gas protection measures.
- 5.1.2 During each inspection and/or integrity testing visit, in accordance with the verification plan, a record was kept of the progress, installation details, materials used, and integrity testing undertaken. These records are documented on the proforma certificate sheets, copies of which are presented in Appendix C.
- 5.1.3 A photographic record was taken during each visit, which can be viewed upon request. A selection of key photographs from various stages of installation and validation are presented on the proforma certificate sheets presented in Appendix C.
- 5.1.4 IDG can confirm that independent visual inspections and integrity testing were undertaken for all key elements as outlined in the Verification Implementation Plan.
- 5.1.5 IDG are satisfied that all gas membrane installation works were carried out by the appointed specialist installer named in the Implementation Plan.

5.2 Non-Independent QA Inspection Records

- 5.2.1 Non-independent QA inspection records completed by the client and/or the installer have been provided to IDG for review. Copies of these records are presented in Appendix D to provide supplementary evidence and documentation of the radon protection measures installation.
- 5.2.2 IDG are satisfied that the non-independent QA information is relevant to and representative of

the radon protection works completed.

5.3 Gas Protection Products

- 5.3.1 IDG can confirm that gas protection measures installed and validated at the site were installed using the products specified in the Verification Plan.
- 5.3.2 The only exception to this was an upgrade to higher durability membranes in key areas of the site. Further details of this variation are provided in Section 6.1 below.
- 5.3.3 No other changes or amendments were made to the products specified in the Verification Implementation Plan during the construction and installation of gas protection measures at the development.

6 VARIATION FROM IMPLEMENTATION PLAN

6.1 Variation to Specified Gas Protection Products

- 6.1.1 As noted above, the client notified IDG of a proposed change of membrane product proposed for use across the swimming pool and main ground-floor areas.
- 6.1.2 The change of product was from the originally specified Juta GP5 membrane to a heavier gauge Juta GP-H 0.6mm membrane to provide greater damage resistance in the heavily trafficked areas of the site.
- 6.1.3 Following review of the manufacturer's specification sheets, IDG were satisfied that the upgraded Juta GP-H 0.6mm membrane is compliant with the required standard and performance specification to provide appropriate radon resistance, and confirmed suitability for the intended use as part of the overall radon protection measures. A copy of the technical data sheet for the Juta GP-H is presented in Appendix E.

6.2 Minor Design Variation Associated with Change of Product

- 6.2.1 Following the approval of the Juta GP-H membrane as discussed above, the client issued some minor revised design detail drawings associated with the change of product to show how this would be integrated into the wider radon protection system in the key areas of use.
- 6.2.2 Copies of these drawings are included in Appendix E for completeness, and following review by IDG were determined to provide appropriate protection and continuity with the wider radon protection system.

7 ON-GOING DUTY OF CARE AND VERIFICATION

- 7.1.1 Whilst the gas protection measures inspections and testing have been satisfactorily completed and verified at the time of this final verification report, until the floor construction is completed with insulation and concrete screed in place to protect the membrane there remains the potential for the integrity of the installed gas protection measures to be compromised post-verification as a result of follow on trades.
- 7.1.2 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.

- 7.1.3 It is recommended that the site manager/ foreman undertakes a final visual check of any installed exposed membrane immediately before the placement of any protective insulation or final floor screeding.
- 7.1.4 Site staff and contractors have a duty of care to prevent post-verification damage to gas protection measures, and to report back to IDG should any such damage take place post-validation, to ensure any necessary repairs can be made before final screeding.

8 OUTSTANDING POST-CONSTRUCTION RADON MONITORING

8.1 Radon Monitoring Requirements

- 8.1.1 As outlined in the Implementation Plan, 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.
- 8.1.2 Post-construction radon monitoring is outside of IDG's scope of works and expertise, and therefore is not be documented within IDG's Radon Protection Verification Report.
- 8.1.3 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.
- 8.1.4 Copies of the post-construction radon monitoring data and any associated reports should be issued to the Local Authority EHO for completeness, and may also be required by building control, warranty providers and the ultimate owner/end-user of the building.

9 CONCLUSION

- 9.1.1 ***The Radon Ground Gas Protection Measures installed in the new Radcliffe Civic Hub building in Radcliffe have been installed and validated in accordance with the agreed 'Hazardous Gas Protection Measures Verification Plan, Report Ref. 5238-G-R004', with variations and amendments as detailed in this report.***
- 9.1.2 ***Post-construction Radon Monitoring is required as detailed in Section 8 above.***

Appendix A