



Report  
Title:

# Ground Gas Verification Report

Project  
Name:

## Public Open Space, Wygate Park, Spalding



Report  
Reference:

**BRD241183-OR14-A**

Date:

**November 2020**

### **BRD Environmental Ltd**

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# REPORT CONTROL SHEET

|              |                                          |
|--------------|------------------------------------------|
| REPORT TITLE | GROUND GAS VERIFICATION REPORT           |
| PROJECT      | PUBLIC OPEN SPACE, WYGATE PARK, SPALDING |
| CLIENT       | KIER LIVING                              |

| REPORT REFERENCE | ISSUE DETAIL | DATE       | PREPARED BY | CHECKED BY |
|------------------|--------------|------------|-------------|------------|
| BRD241183-OR14-A | First Issue  | 17/11/2020 | M Wood      | M Morgan   |

## BRD Environmental Limited

Geotechnical and Environmental Services

- Ground Investigation
- Japanese Knotweed Removal
- Soil, Water and Gas Testing
- Contamination Assessment
- Geotechnical Advice
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Ground Gas Verification Report  
Public Open Space, Wygate Park, Spalding  
BRD241183-OR14-A Gas Verification

# REPORT LAYOUT

This report is divided into the following two sections: Technical Report and Appendices.

## TECHNICAL REPORT

The main report section is intended to provide the technical detail of the investigation and is intended to provide the level of information required by current guidance documents and practice. The Technical Report is written in a language that, in part, assumes knowledge of subject matter so that it can be written in as concise a form as possible. Its intended audience is peers, regulators and other professionals in related disciplines.

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## REFERENCES

## APPENDICES

The final section of the report presents the factual data collected and employed as part of the investigation.

### APPENDIX 1 SITE PLANS & PHOTOGRAPHS

|                               |                                                                                  |
|-------------------------------|----------------------------------------------------------------------------------|
| Site Layout Plan              | 'Site Plan', Robert Doughty Consultancy, dwg no. 520-247_PL_SP01, dated 22/10/18 |
| Revised Conceptual Site Model | BRD241183-OP12-A                                                                 |

### APPENDIX 2 VERIFICATION RECORDS

|                                     |               |
|-------------------------------------|---------------|
| BRD Gas Membrane Inspection Records | 57 x A4 pages |
|-------------------------------------|---------------|

### APPENDIX 3 CLIENT SUPPLIED INFORMATION

|                                   |                  |
|-----------------------------------|------------------|
| Groundworker Supplied Photographs | BRD241183-OP13-A |
| Written Statement of Installation | 1 x A4 page      |

# 1. INTRODUCTION TO TECHNICAL REPORT

## 1.1. CONTRACT DETAILS

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>CLIENT</b>            | Kier Living Ltd trading as Kier Living.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>SITE</b>              | Land situated at Wygate Park in the town of Spalding, Lincolnshire.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>CLIENT'S ADVISORS</b> | BRD Environmental Limited (BRD) has been commissioned directly by the Client.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>REPORT CONTEXT</b>    | The Client is in the process of redeveloping the site for residential housing.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>REPORT TYPE</b>       | Ground Gas Verification Report.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>REPORT OBJECTIVES</b> | <p>This report aims to demonstrate that the remedial measures for the site, in the form of ground gas protection measures, have been suitably installed and verified in accordance with the ground gas verification plan, referenced as follows:</p> <ul style="list-style-type: none"><li>• 'Ground Gas Verification Plan – Public Open Space, Wygate Park, Spalding', BRD Environmental Ltd, report ref. BRD241183-OR11-A, September 2019.</li></ul> <p>This in turn should address Condition 4 of the planning permission ref. H16-1117-18 granted by South Holland District Council.</p> |

## 1.2. SCOPE OF WORKS

The agreed scope of works was:

- Attendance by Geo-Environmental Consultant to verify correct fitting of gas protection measures to the new building through thorough visual inspection and mechanical point stress tests. Issue inspection report after each visit.
- Provision of equipment for performing air lance tests on membrane joints.
- Provision of a Remediation Verification Report on completion of fitting all the gas protection measures.

## 1.3. REPORT LIMITATIONS

Any site boundary lines depicted on plans included within this report are approximate only and do not imply legal ownership of land. Any observations of tree species, asbestos containing materials within structures or invasive weeds, such as Japanese Knotweed, does not constitute a formal survey of such features. The identification of such features is therefore tentative only. The report does not consider whether sensitive ecology or archaeology is present as these require consideration by professionals specialising in these matters. It should be recognised that the collection of desk study information may not be exhaustive and that other information pertinent to the site may be available.

The recommendations, interpretations and conclusions of this report are based solely on the ground conditions found at the exploratory holes. Due to the variability in the nature of ground, conditions between exploratory holes can only be interpreted and not defined. The description

of the site and the ground conditions is accurate only for the dates of the field works. In particular, groundwater levels can vary due to seasonal and other effects.

The assessment and interpretation of contamination risks is based on the scope of works agreed with the Client together with the budgetary and programme constraints imposed. Further investigation, analysis and assessment of contamination may be required by regulators or other third parties with an interest in the site. An ecological risk assessment of contaminated soils is beyond the scope of this report. This report is concerned with assessing those contamination risks which apply to the future use of the site through the proposed development as part of the planning regime.

This report is restricted to a contamination assessment only and does not include any form of geotechnical advice.

## 2. SITE CHARACTERISTICS

### 2.1. SITE SETTING

|                                   |                                                                           |
|-----------------------------------|---------------------------------------------------------------------------|
| <b>SITE ADDRESS AND POST CODE</b> | Land north of Witham Road, Wygate Park, Spalding, Lincolnshire, PE11 3WT. |
| <b>NATIONAL GRID REFERENCE</b>    | 523552E, 323056N.                                                         |

### 2.2. SITE DESCRIPTION

| <b>SUBJECT</b>                  | <b>COMMENTS</b>                                                                                                                                                                                                                                                                                                                                                                         |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>CURRENT SITE DESCRIPTION</b> | The site currently comprises a former area of public open space within the larger Wygate Park development. It is now undergoing redevelopment as residential houses. A pumping station and electricity substation are present along the southern site boundary.                                                                                                                         |
| <b>SURROUNDING LAND USE</b>     | The surrounding land use is predominantly residential with the exception of a school which is immediately adjacent to the western site boundary.                                                                                                                                                                                                                                        |
| <b>PROPOSED DEVELOPMENT</b>     | It is proposed that the site will be developed with 34No. residential houses with associated garages and private gardens.                                                                                                                                                                                                                                                               |
| <b>HISTORICAL SUMMARY</b>       | The site has remained relatively un-developed throughout its history. From the 1960's until 2000, moveable greenhouses were evident in the north eastern corner of the site. A construction site compound is identified along the western site boundary in aerial imagery from 2016, however, this was not present at the time of the 2018 site works and the area had been reinstated. |
| <b>PUBLISHED GEOLOGY</b>        | The site is underlain by superficial deposits of the Terrington Beds and Barroway Drove Beds. At the base of these a thin band of Glacio-lacustrine deposits were sporadically encountered. Beneath, clays comprising of Glacial Till are present. The underlying bedrock geology comprises of Oxford Clay.                                                                             |
| <b>RADON</b>                    | Radon gas protection measures are not required.                                                                                                                                                                                                                                                                                                                                         |

### 2.3. PREVIOUS INVESTIGATIONS

The wider residential estate has been the subject of several phases of investigation which has included some exploratory holes being undertaken on the site. The following site investigation reports contain information that is relevant to the site:

- 'Site Investigation – Residential Area, Wygate Park, Spalding', BRD Environmental Ltd, report ref. BRD241183-OR1-A, dated September 2010.
- 'Site Investigation – School Site, Wygate Park, Spalding', BRD Environmental Ltd, report ref. BRD241183-OR2-A, dated September 2010.

- 'Site Investigation – Open Space, Wygate Park, Spalding', BRD Environmental Ltd, report ref. BRD241183-OR3-A, dated September 2010.
- 'Gas Risk Assessment - Wygate Park, Spalding', BRD Environmental Ltd, report ref. BRD241183-OR5-A, dated March 2011.
- 'Site Investigation – Southern and Eastern Areas, Wygate Park, Spalding', BRD Environmental Ltd, report ref. BRD241183-OR7-A, dated August 2012.

Of particular note is the gas risk assessment undertaken within BRD report ref. BRD241183-OR7-A which considered the gas monitoring results from across the Wygate Park development. This previous report identified the need for NHBC Amber 1 gas protection measures across the site on account of the elevated methane and carbon dioxide concentrations associated with the natural organic soils.

The information from these reports was reviewed and the site itself was subject to an intrusive ground investigation that was reported in:

- 'Geo-Environmental Site Investigation - Public Open Space, Wygate Park, Spalding', BRD Environmental Ltd, report ref. BRD241183-OR9-A, dated October 2018.

This report considered that the proposed development of the Public Open Space land is consistent with the NHBC gas model and so in order to maintain continuity with the rest of the development it was considered that NHBC Amber 1 protection measures should be applied.

Subsequently a gas protection Verification Plan was developed by BRD referenced as follows:

- 'Ground Gas Verification – Public Open Space, Wygate Park, Spalding', BRD Environmental Ltd, report ref. BRD241183-OR11-A, September 2019.

The Verification Plan included details on the gas protection measures and the requirements regarding independent verification of the gas membrane installation.

### **3. SUMMARY OF GAS VERIFICATION PLAN**

#### **3.1. CONTAMINATION SOURCES**

Following the previous contamination assessment report the only valid source in the context of the proposed development was the risk of migration of ground gases from the high organic content within the underlying soils.

#### **3.2. REMEDIATION REQUIREMENTS**

##### **3.2.1. Floor Detail**

Void ventilation through air bricks and periscopic vents should be provided to whichever gives the greater opening area: 1,500mm<sup>2</sup> per metre run of external wall and 500mm<sup>2</sup> per m<sup>2</sup> of floor area. The minimum design void beneath the floor is 225mm.

##### **3.2.2. Membrane**

Kier Living have specified the use of Visqueen Low Permeability Gas Membrane. The fitting contractor confirmed they will be sealing joints with tape rather than welding. The Visqueen Low Permeability Gas Membrane should be overlapped by at least 150mm and bonded with Visqueen Double Sided Tape. The joint should then be secured with Visqueen Gas Resistant (GR) Foil Jointing Tape.

##### **3.2.3. Fitters**

The contractor responsible for fitting the gas protection measures, including the gas resistant membrane, is the appointed ground works contractor for the development - CER Groundworks Limited.

##### **3.2.4. Verification**

###### **3.2.4.1. *Rate of Verification***

It was considered that the following rate of inspections was appropriate for the site:

- Independent Consultant verification of the membrane as fitted to the first plot.
- Independent Consultant verification of the membrane after the installation of steel mesh reinforcement to the first plot.
- Subsequent independent Consultant verification inspections of the membrane at a minimum rate of 1 in 5 plots (i.e. 20% of plots or approximate minimum 6 plots).
- Groundwork contractor to provide statements and photographic evidence of successful fitting of membranes in remaining plots that are not inspected by the Consultant.

The minimum rate of independent verification inspections stated assumed that only minor occasional readily remedied defects are found during inspections.

#### *3.2.4.2. Personnel Carrying out the Verification*

Kier Living has appointed BRD Environmental Ltd (BRD) to undertake the verification of the ground gas protection measures.

#### *3.2.4.3. Inspection Visits*

The independent verification procedure was to be by thorough visual examination by the BRD Consultant.

The air bricks, periscopic vents, sub-floor voids and cross ventilation voids in sleeper walls were all to be inspected as these are observed elsewhere on site.

Membrane fitting was to be the main focus of BRD inspections visits. The inspection was to check that the membrane is free from tears and punctures, and is lapped and sealed in accordance with good practice at joints and around service entries.

Where non-conformances are recorded by inspections, these were to be identified to the contractor and remedial action undertaken.

#### *3.2.4.4. Contractor Provided Evidence*

For house plots that are not subject to inspection by BRD, the groundworks contractor was to supply a clear statement that the gas protection measures were installed in accordance with the design and manufacturer's instructions. Such plot specific statements were to include photographs showing the installed membrane.

#### *3.2.4.5. Site Management*

During the initial inspection visit, BRD would emphasise the need for the site management to be vigilant that the gas protection membrane is protected from damage by follow on trades. If non-conformances were found during a site inspection, the BRD verifier was to discuss these with site management so they were aware of issues and be vigilant for any such further occurrences.

The fitting of the gas protection measures would also be inspected by the NHBC during routine inspections under building regulations. Site management were to inform BRD if the NHBC Building Inspector raised any concerns with regard to the fitting of gas protection measures.

## **4. ACTUAL REMEDIATION WORKS COMPLETED**

### **4.1. GENERAL**

The gas membranes were installed by CER Groundworks Limited. Whilst this contractor's operatives have no formal training qualifications in the fitting of gas protection membranes, the groundworker does have a large amount of practical experience in the fitting of gas protection measures to the satisfaction of NHBC building control inspectors. This approach is compliant with CIRIA C735.

The works were independently verified by BRD who inspected 27No. of the 34No. plots. It was initially anticipated that BRD would verify approximately 20% of the installed membranes, however, due to minor faults being found on the majority of inspection visits it was decided that the frequency of inspection visits should be significantly increased.

Plots 908/909, 917/918/919 and 933/934 were not inspected or verified by BRD but the fitters have provided a statement and photographic evidence of successful fitting. These were installed towards the end of the works once BRD were confident that the groundworker was installing the membranes to the required standard.

The 27No. membrane installations were completed between 8<sup>th</sup> October 2019 and 10<sup>th</sup> August 2020. The dates of the BRD inspection visits are presented below:

- 9<sup>th</sup> October 2019 – Plot 904 inspected and verified.
- 25<sup>th</sup> October 2019 – Plots 901/902/903 inspected and verified.
- 30<sup>th</sup> October 2019 – Plots 905/906/907 inspected and verified.
- 28<sup>th</sup> November 2019 – Plots 910/911 inspected and verified.
- 3<sup>rd</sup> December 2019 – Plots 912/913/914 Inspected and verified. Plot 920 partially inspected and verified.
- 29<sup>th</sup> January 2020 – Plots 915 and 916 inspected and verified.
- 12<sup>th</sup> February 2020 – Plots 912/913 inspected and verified.
- 11<sup>th</sup> March 2020 – Plots 924/925 and stairwells of Plots 923 and 926 inspected and verified.
- 24<sup>th</sup> March 2020 – Plots 927/928/929 inspected and verified.
- 10<sup>th</sup> August 2020 – Plots 930/931/932 inspected and verified.

The detailed records of the inspection visits are presented in the appendices.

## **4.2. GAS PROTECTION MEASURES**

### **4.2.1. Floor Detail**

The air bricks and periscopic vents were installed to all plots to the required specification and confirmed by BRD. Where possible the sub-floor voids for each plot were inspected and confirmed to be of the required depth, prior to the installation of the gas membrane.

### **4.2.2. Gas Membrane**

The membranes were all successfully laid by the groundworkers according to the agreed specification. The membrane used was the Visqueen Low Permeability Gas Membrane as proposed in the Verification Plan. The joints were sealed with Visqueen Double Sided Tape and secured with Visqueen Gas Resistant (GR) Foil Jointing Tape.

Most of the plots consisted of rectangular areas so the membrane installation was relatively straightforward. BRD witnessed a few defects during the inspection visits which usually consisted of inadequate seals or small punctures within the membrane. All defects were pointed out to the installer and repaired at the time. BRD verified all repairs.

Where possible, BRD also inspected the edge of the membranes of verified plots once the concrete screed had been poured to ensure they remained in good condition prior to the bricks being laid. No defects were identified and it was evident that the groundworkers were taking care not to damage the membrane.

## 5. VERIFICATION

### 5.1. MEMBRANE INSTALLATION

The membrane installation was independently verified and approved by BRD. Those plots verified by BRD and those self-certified by the groundworkers are identified in the table below.

The verification inspections involved visual inspection of the membrane, the use of mechanical stress testing on all joints and seals and the use of air lance testing where appropriate.

BRD witnessed a few defects during the inspection visits which usually consisted of inadequate seals or small punctures within the membrane. All defects were pointed out to the installer and repaired at the time. BRD verified all repairs. This verification confirms that a suitable membrane has been installed to each building and this has been verified in accordance with the proposed strategy.

The Gas Protection Measures Inspection Reports completed after each verification visit are included in Appendix 2 and these should be referred to for further details, however, a brief summary of each visit is provided in the table below.

| PLOTS       | COMMENTS                                                                                                                                                                                                                                                                                                                                                                    |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 901/902/903 | Inspected and verified by BRD – 25/10/2019.<br>The membrane was in good condition with no defects identified. One major tear on a corner joint which was repaired by the fitter.<br>Presence of sub-floor void, air bricks and periscopic ducts confirmed by BRD.                                                                                                           |
| 904         | Inspected and verified by BRD – 09/10/2019.<br>Membrane was in good condition. Three minor defect identified in relation to the laps, weld and joint seals which were repaired and verified the following day by BRD.<br>Presence of air bricks and periscopic ducts confirmed by BRD.                                                                                      |
| 905/906/907 | Inspected and verified by BRD – 30/10/2019.<br>The membrane was in very good condition with no defects identified. Minor tearing of three corner joints was identified where the wind had lifted the membrane and put pressure on the joints. Defects immediately repaired by the fitters.<br>Presence of sub-floor void, air bricks and periscopic ducts confirmed by BRD. |
| 908/909     | Groundworker contractor provided statement and photographic evidence of successful fitting of gas protection measures.<br>Presence of sub-floor void, air bricks and periscopic ducts confirmed by BRD.                                                                                                                                                                     |

|                 |                                                                                                                                                                                                                                                                                                                                            |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 910/911         | <p>Inspected and verified by BRD – 28/11/2019.</p> <p>The membrane was in very good condition with no defects identified. Seven minor defects identified in relation to the joints and seals which were immediately repaired.</p> <p>Presence of sub-floor void, air bricks and periscopic ducts confirmed by BRD.</p>                     |
| 912/913/914     | <p>Inspected and verified by BRD – 03/12/2019.</p> <p>The membrane was in good condition with one minor defect identified which was repaired immediately by the fitter. Three minor defects noted to the laps, welds and seals which were repaired by the fitter.</p> <p>Presence of air bricks and periscopic ducts confirmed by BRD.</p> |
| 915             | <p>Inspected and verified by BRD – 29/01/2020.</p> <p>The membrane was in good condition with one defect identified which was immediately repaired by the fitter.</p> <p>Presence of air bricks and periscopic ducts confirmed by BRD.</p>                                                                                                 |
| 916             | <p>Inspected and verified by BRD – 29/01/2020.</p> <p>The membrane was in good condition with no defect identified. Three minor defects identified around corner joints which were immediately repaired by the fitter.</p> <p>Presence of air bricks and periscopic ducts confirmed by BRD.</p>                                            |
| 917/918/919     | <p>Groundworker contractor provided statement and photographic evidence of successful fitting of gas protection measures.</p> <p>Presence of sub-floor void, air bricks and periscopic ducts confirmed by BRD.</p>                                                                                                                         |
| 920             | <p>Partially inspected and verified by BRD – 03/12/2019.</p> <p>The membrane was in very good conditions with no defects identified. No defects noted with regards to the laps, seals and welds.</p> <p>Presence of sub-floor void, air bricks and periscopic ducts confirmed by BRD.</p>                                                  |
| 921/922         | <p>Inspected and verified by BRD – 12/02/2020.</p> <p>The membrane was in good condition with four patch repairs noted. One minor defect identified around a service entry point which was repaired by the fitter.</p> <p>Presence of air bricks and periscopic ducts confirmed by BRD.</p>                                                |
| 923 (Stairwell) | <p>Inspected and verified by BRD – 11/03/2020.</p> <p>The membrane was in good condition with no defect identified. One small hole identified in silver tape which was repaired by the fitter.</p> <p>Presence of air bricks and periscopic ducts confirmed by BRD.</p>                                                                    |

|                 |                                                                                                                                                                                                                                                                                                                                               |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 924/925         | <p>Inspected and verified by BRD – 11/03/2020.</p> <p>The membrane was in good condition with no defect identified. Two minor defects identified around service entry points which were immediately repaired by the fitter.</p> <p>Presence of air bricks and periscopic ducts confirmed by BRD.</p>                                          |
| 926 (Stairwell) | <p>Inspected and verified by BRD – 11/03/2020.</p> <p>The membrane was in good condition with no defect identified. Three minor defects identified around a corner joint which was immediately repaired by the fitters.</p> <p>Presence of air bricks and periscopic ducts confirmed by BRD.</p>                                              |
| 927/928/929     | <p>Inspected and verified by BRD – 24/03/2020.</p> <p>The membrane was generally in a good condition with five minor punctures identified which were repaired immediately by the fitter. One minor defect on a corner joint which was also repaired.</p> <p>Presence of sub-floor void, air bricks and periscopic ducts confirmed by BRD.</p> |
| 930/931/932     | <p>Inspected and verified by BRD – 11/08/2020.</p> <p>The membrane was generally in good condition with only one minor defect which was immediately repaired by the fitter.</p> <p>Presence of sub-floor void, air bricks and periscopic ducts confirmed by BRD.</p>                                                                          |
| 933/934         | <p>Groundworker contractor provided statement and photographic evidence of successful fitting of gas protection measures.</p>                                                                                                                                                                                                                 |

## 5.2. CONCLUSION

The gas protection measures for the residential development have been successfully installed and verified in accordance with the agreed verification plan.

Therefore, the site is now deemed suitable for use in the context of the identified contamination risks.

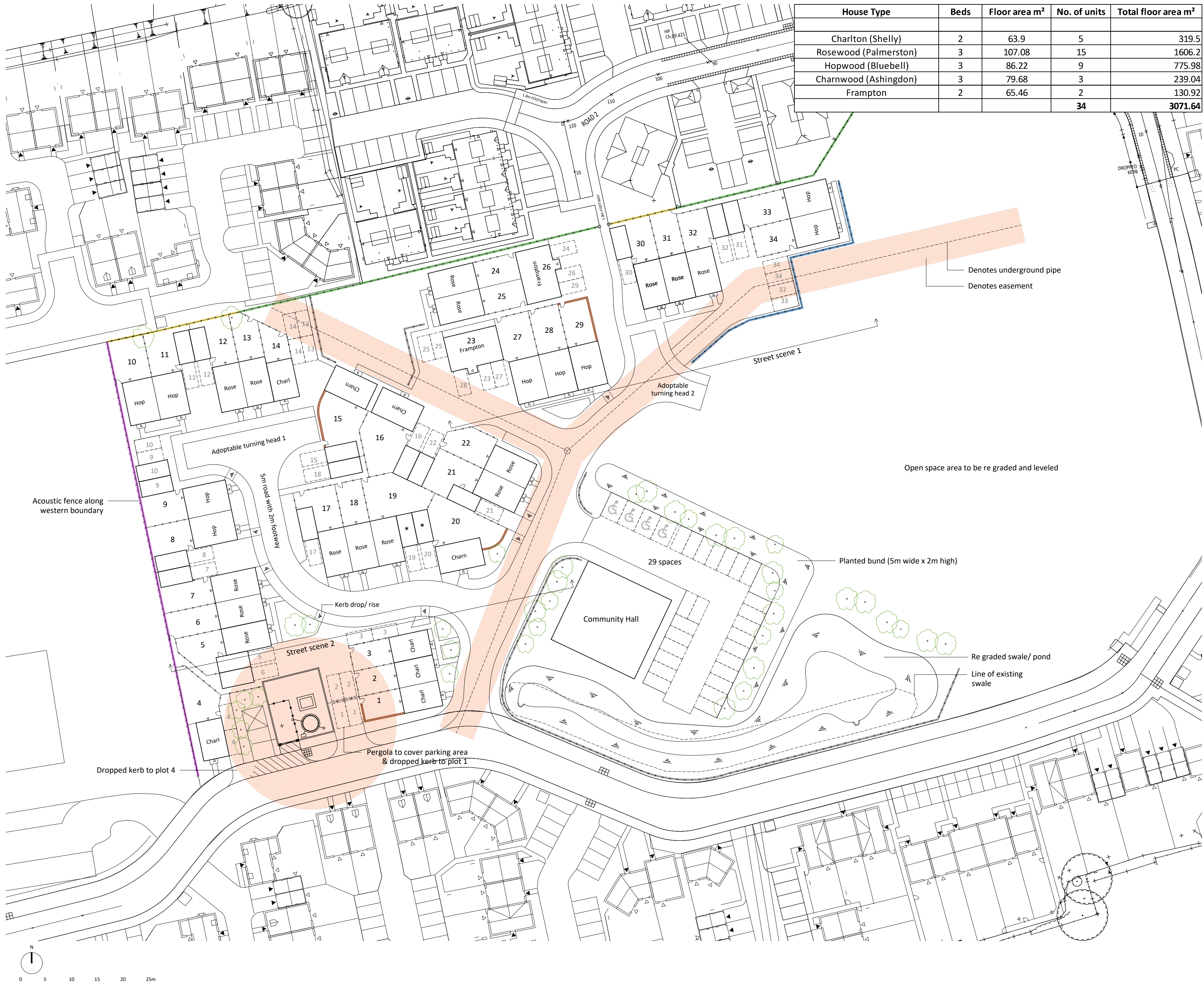
This report should be submitted to the planning department of the local authority in order to confirm the remedial measures have been completed in accordance with the verification plan and the relevant planning conditions can be discharged.

## REPORT SPECIFIC REFERENCES

- 'Site Investigation – Residential Area, Wygate Park, Spalding', BRD Environmental Ltd, report ref. BRD241183-OR1-A, dated September 2010.
- 'Site Investigation – School Site, Wygate Park, Spalding', BRD Environmental Ltd, report ref. BRD241183-OR2-A, dated September 2010.
- 'Site Investigation – Open Space, Wygate Park, Spalding', BRD Environmental Ltd, report ref. BRD241183-OR3-A, dated September 2010.
- 'Gas Risk Assessment - Wygate Park, Spalding', BRD Environmental Ltd, report ref. BRD241183-OR5-A, dated March 2011.
- 'Site Investigation – Southern and Eastern Areas, Wygate Park, Spalding', BRD Environmental Ltd, report ref. BRD241183-OR7-A, dated August 2012.
- 'Geo-Environmental Site Investigation - Public Open Space, Wygate Park, Spalding', BRD Environmental Ltd, report ref. BRD241183-OR9-A, dated October 2018.
- 'Ground Gas Verification – Public Open Space, Wygate Park, Spalding', BRD Environmental Ltd, report ref. BRD241183-OR11-A, September 2019.
- 'Good Practice on the Testing and Verification of Protection Systems for Buildings Against Hazardous Ground Gases', CIRIA, report ref. C735, dated August 2014.



# **APPENDIX 1**



| House Type            | Beds | Floor area m <sup>2</sup> | No. of units | Total floor area m <sup>2</sup> |
|-----------------------|------|---------------------------|--------------|---------------------------------|
| Charlton (Shelly)     | 2    | 63.9                      | 5            | 319.5                           |
| Rosewood (Palmerston) | 3    | 107.08                    | 15           | 1606.2                          |
| Hopwood (Bluebell)    | 3    | 86.22                     | 9            | 775.98                          |
| Charnwood (Ashingdon) | 3    | 79.68                     | 3            | 239.04                          |
| Frampton              | 2    | 65.46                     | 2            | 130.92                          |
|                       |      |                           | 34           | 3071.64                         |

Notes

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CDM 2015  
This drawing is for illustrative purposes and/or obtaining the relevant planning permission only. It should not be used for construction and accordingly, risk identification under the Construction (Design & Management) Regulations 2015 has not been undertaken.

\* Denotes garage

**Boundary Treatments Key**

- 1.8m high close boarded fence
- 1.8m high acoustic fence
- 1.2m high post & rail fence
- 0.5m high knee rail fence
- 1.8m high garden wall
- Existing metal fence
- Existing metal fence to be replaced or retained with the addition of a 1.8m high close boarded fence

| Rev | Description | Date |
|-----|-------------|------|
|     |             |      |

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Client

Kier Living Ltd

Project

Central Open Space

Wygate Park, Spalding

Drawing

Site Plan

Scale @ A2

1: 500

Date

22/10/18

Drawn By

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Checked By

RJCD

Job Number

520-247

Status

PL

Purpose of Issue

Planning

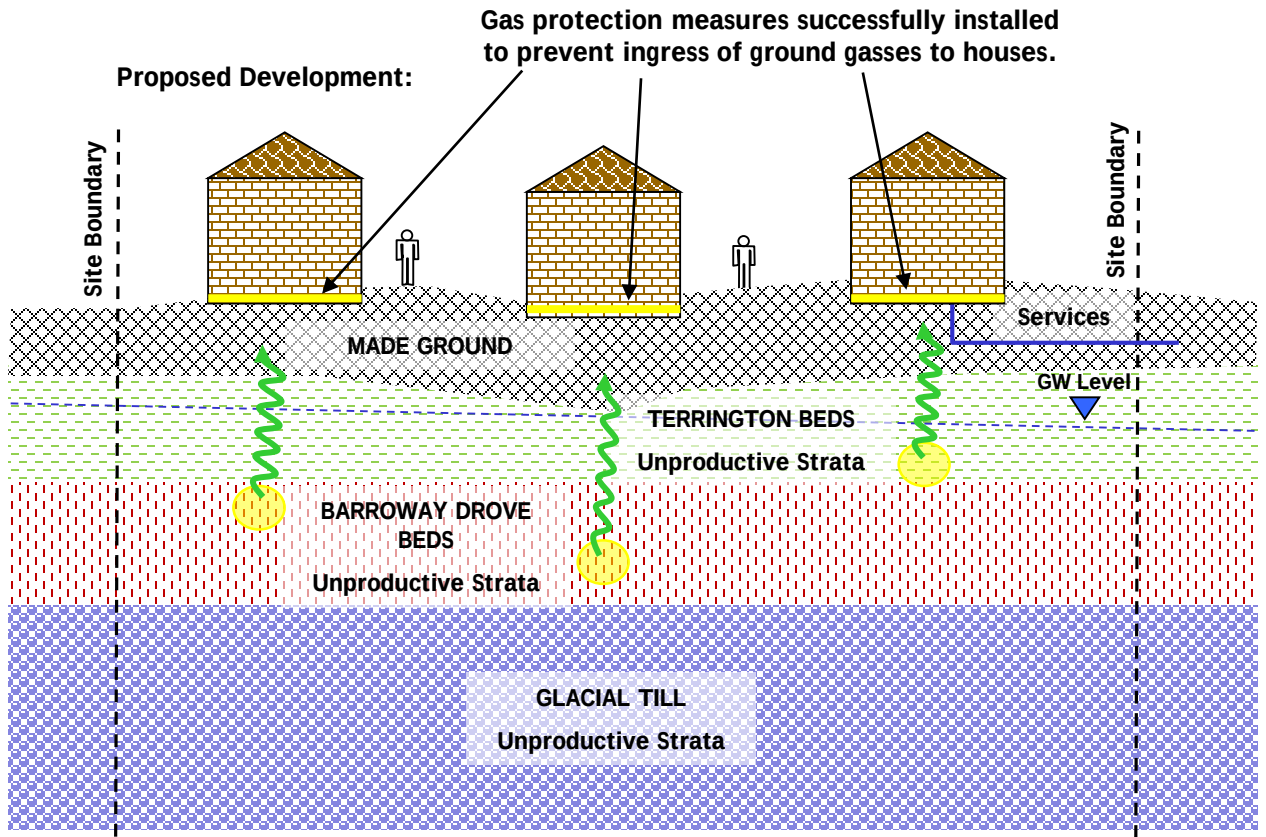
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520-247\_PL\_SP101

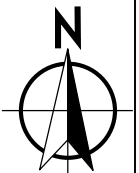
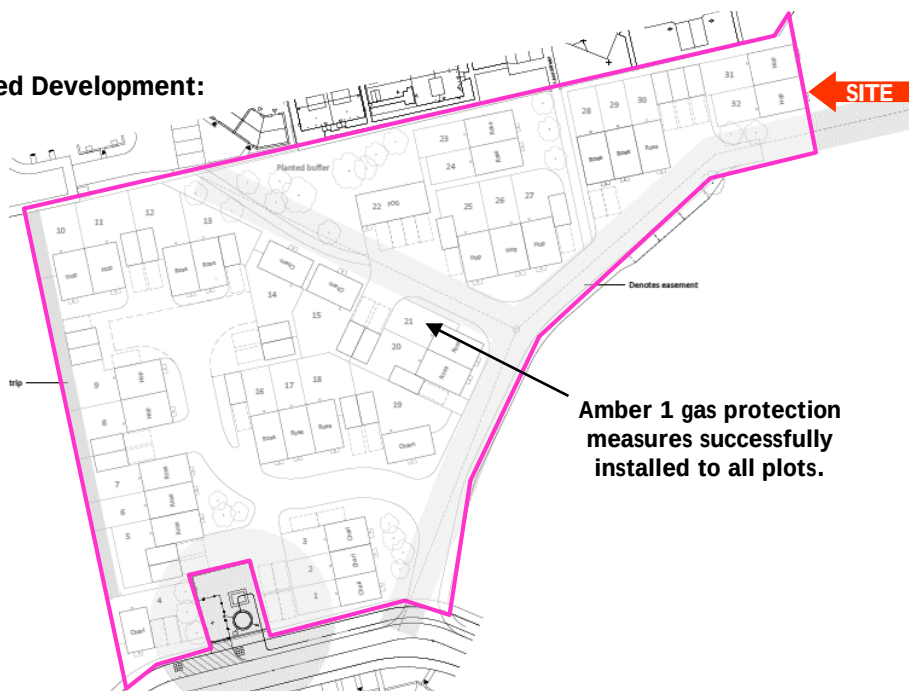
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-

# Revised Conceptual Site Model



## Proposed Development:



Project Title: Public Open Space, Wygate Park, Spalding  
 Client: Kier Living  
 BRD Reference: BRD241183-OP12-A  
 Date Issued: November 2020

## **APPENDIX 2**

## GAS PROTECTION MEASURES INSPECTION REPORT

|                            |                                 |                                      |                                                                          |
|----------------------------|---------------------------------|--------------------------------------|--------------------------------------------------------------------------|
| <b>Site:</b>               | POS Area, Wygate Park, Spalding | <b>Plot(s):</b>                      | Plot 904: Membrane.<br>Plots 905 to 911: Ventilation and sub-floor void. |
| <b>Project No.</b>         | BRD241183                       | <b>Gas Characteristic Situation:</b> | NHBC Amber 1.                                                            |
| <b>Client:</b>             | Kier Living.                    | <b>Development Type:</b>             | Residential.                                                             |
| <b>Inspection date:</b>    | 8/10/2019                       | <b>Building Description:</b>         | Traditional Detached or Semi-Detached Houses                             |
| <b>Inspection by:</b>      | B Devonshire                    | <b>Floor Type:</b>                   | Suspended block and beam.                                                |
| <b>Weather Conditions:</b> | Overcast. Recently rained.      | <b>Gas Protection Type:</b>          | Passive.                                                                 |

### GAS MEMBRANE

|                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Gas Membrane Type:</b>           | Visqueen Low Permeability Gas Membrane.                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Membrane Condition:</b>          | Plot 904: Good condition with minimal trafficking and evidence of use of crawl boards to protect membrane.                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Underside of gas membrane:</b>   | Gas membrane placed evenly over beam and blocks insulation. No debris or stress points seen beneath membrane.                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Jointing tape product:</b>       | Visqueen Gas Barrier Foil Jointing Tape and Visqueen Double Sided DPM Joint Tape.                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Laps, Welds and joint seals:</b> | Plot 904: Generally good tape joints and recent rain ponding confirms good watertight joints. Three minor defects were identified. The defects were drawn to the attention of the groundworker. It was agreed that as the membrane was damp, repairs would be made once it had dried out. BRD would re-inspect these areas at the same time checking the placement of the steel mesh reinforcement has not caused any punctures. BRD also provided some tips and advice to the fitting of gas membranes. |
| <b>Service entry seals:</b>         | Preformed Visqueen top hats secured with tape and jubilee clip.                                                                                                                                                                                                                                                                                                                                                                                                                                          |

| VENTILATION                                              |                                                                                                                                                                                                                                                                                        |
|----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Sub-Floor Void:</b>                                   | <p>Plots 905 to 909: Open void inspected in several places where holes in insulation blocks allowed and all measurements in excess of 200mm.</p> <p>Plots 910 to 911: It was apparent that although the beams had yet to be placed, allowance for a sufficient void had been made.</p> |
| <b>External wall air bricks:</b>                         | From inspection, sufficient air bricks and periscopic ducts had been provided.                                                                                                                                                                                                         |
| <b>Internal sleeper walls:</b>                           | None inspected.                                                                                                                                                                                                                                                                        |
| <b>External vent trenches / ducts or other features:</b> | n/a.                                                                                                                                                                                                                                                                                   |

## Photographs:

**Photo 1** – Membrane employed.



**Photo 2** – Tape materials used.



**Photo 3** – Plot 904, the first plot to have the membrane fitted. Note black crawl board used when fitting central joint left in place for the purpose of the verification inspection.



**Photo 4** – Sub-floor void in Plots 905 to 907.



**Photo 5** – Plot 910/911 before placement of beams showing ready void and periscopic vents.



**Photo 6** – Plots 908/909 showing air bricks and periscopic vents. Thick layer of final insulation yet to be laid upon which the membrane will be fitted. Not plot 904 in distance with yellow membrane.



**CONCLUSION:**

The specified membrane has been employed and sufficient stocks are available on site for the foreseeable future needs.

The air brick, periscopic ducts and voids inspected are acceptable and comply with the requirements.

The membrane to Plot 904 has three minor defects that require re-inspection.

## GAS PROTECTION MEASURES INSPECTION REPORT

|                            |                                 |                                      |                                                                                                                    |
|----------------------------|---------------------------------|--------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| <b>Site:</b>               | POS Area, Wygate Park, Spalding | <b>Plot(s):</b>                      | Plot 904: Membrane defect repairs and placement of reinforcing mesh.<br><br>Plots 901 to 903: Void and air bricks. |
| <b>Project No.</b>         | BRD241183                       | <b>Gas Characteristic Situation:</b> | NHBC Amber 1                                                                                                       |
| <b>Client:</b>             | Kier Living.                    | <b>Development Type:</b>             | Residential                                                                                                        |
| <b>Inspection date:</b>    | 9/10/2019                       | <b>Building Description:</b>         | Traditional Detached or Semi-Detached Houses                                                                       |
| <b>Inspection by:</b>      | B Devonshire                    | <b>Floor Type:</b>                   | Suspended block and beam.                                                                                          |
| <b>Weather Conditions:</b> | Dry and bright.                 | <b>Gas Protection Type:</b>          | Passive.                                                                                                           |

### GAS MEMBRANE

|                                     |                                                                                                                             |
|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| <b>Gas Membrane Type:</b>           | Visqueen Low Permeability Gas Membrane.                                                                                     |
| <b>Membrane Condition:</b>          | Plot 904: Good condition. It was confirmed that the reinforcing steel mesh had been placed with care onto dedicated stands. |
| <b>Underside of gas membrane:</b>   | Previously inspected.                                                                                                       |
| <b>Jointing tape product:</b>       | Visqueen Gas Barrier Foil Jointing Tape and Visqueen Double Sided DPM Jointing Tape.                                        |
| <b>Laps, Welds and joint seals:</b> | Plot 904: The three joint defects that had been previously identified had been adequately sealed.                           |
| <b>Service entry seals:</b>         | Preformed Visqueen top hats secured with tape and jubilee clip.                                                             |

### VENTILATION

|                                  |                                                                                                                                               |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Sub-Floor Void:</b>           | Plots 901 to 903: Open void present.                                                                                                          |
| <b>External wall air bricks:</b> | Plots 901 to 903: Where the walls had reached the required height at the time of inspection, periscopic vents and air bricks had been fitted. |

|                                                          |      |
|----------------------------------------------------------|------|
| <b>Internal sleeper walls:</b>                           | n/a. |
| <b>External vent trenches / ducts or other features:</b> | n/a. |

## Photographs:

**Photos 1 and 2** – Gap in sealing around ‘top hat’ found on Plot 904 and remedied.



**Photo 3 and 4** – Tape seal ran over at fold in membrane creating air gap along fold and repaired defect. Note that Photo 3 (left) shows the defect after it had been opened up by the verifier to make it more obvious where repair was required.

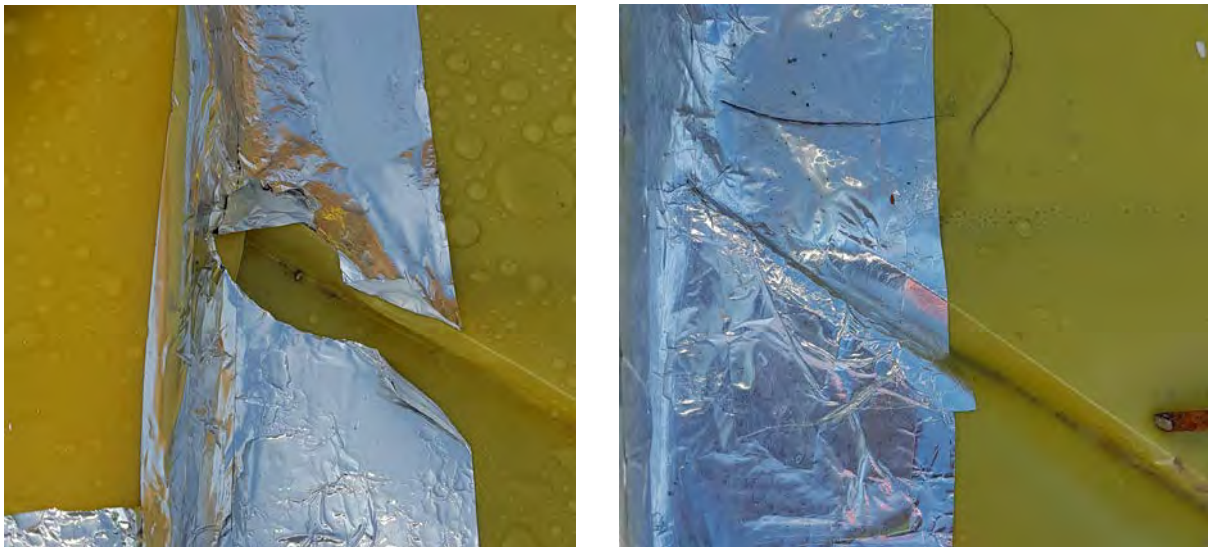


**Photo 5 & 6** – Inadequate sealing of tape against membrane. Note that Photo 5 (left) shows the defect after it had been opened up by the verifier to make it more obvious where repair was required. Photo 6 (right) shows repair and placement of mesh well away from the membrane.

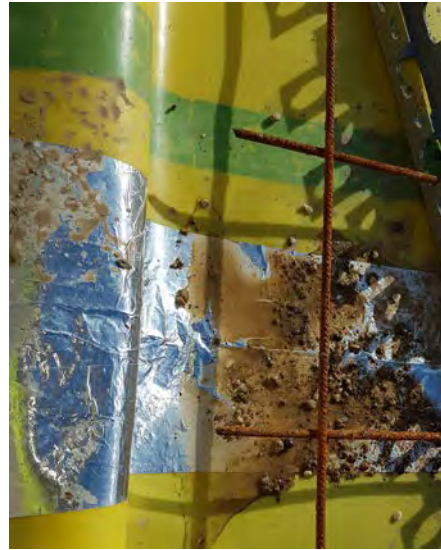


**Photo 7** – Installation of the mesh reinforcement for the screed on the first house (Plot 904). Note use of dedicated supports.



**Photo 8** – Plots 901 to 903 under construction showing air bricks and void.



**CONCLUSION:**

The gas protection measures for Plot 904 are acceptable and comply with the specification.

The air brick, periscopic ducts and voids as inspected in Plot 901 to 903 are acceptable at the stage of construction these were observed.

## GAS PROTECTION MEASURES INSPECTION REPORT

|                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                      |                                              |
|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|----------------------------------------------|
| <b>Site:</b>                        | POS Area, Wygate Park, Spalding                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>Plot(s):</b>                      | 901-903 (terraced block)                     |
| <b>Project No.</b>                  | BRD241183                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Gas Characteristic Situation:</b> | NHBC Amber 1                                 |
| <b>Client:</b>                      | Kier Living.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Development Type:</b>             | Residential                                  |
| <b>Inspection date:</b>             | 25/10/2019                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>Building Description:</b>         | Traditional Detached or Semi-Detached Houses |
| <b>Inspection by:</b>               | M Wood                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>Floor Type:</b>                   | Suspended block and beam.                    |
| <b>Weather Conditions:</b>          | Overcast with showers.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>Gas Protection Type:</b>          | Passive.                                     |
| <b>GAS MEMBRANE</b>                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                      |                                              |
| <b>Gas Membrane Type:</b>           | Visqueen Low Permeability Gas Membrane.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                      |                                              |
| <b>Membrane Condition:</b>          | Good, condition across all three plots. Reinforced steel mesh placed with care onto dedicated stands.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                      |                                              |
| <b>Underside of gas membrane:</b>   | Gas membrane placed evenly over insulation. No debris or stress points seen beneath membrane.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                      |                                              |
| <b>Jointing tape product:</b>       | Visqueen Gas Barrier Foil Jointing Tape and Visqueen Double Sided DPM Joining Tape.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                      |                                              |
| <b>Laps, Welds and joint seals:</b> | <p>Generally good tape joints and recent rain ponding on membrane confirmed water tight joints. Evidence of a single patch repair in the centre of the membrane which had been placed prior to the inspection. Significant tear in membrane at corner of Plot 901 which was pointed out to the fitters by BRD. It was evident that the tear had been spotted by the fitters as material was nearby to make a repair but due to heavy rain the day before the repair was delayed. Membrane dried and repair made whilst BRD were in attendance.</p> <p>Evident that previous tips and advice provided to the membrane fitters had been taken on board and was being followed.</p> |                                      |                                              |
| <b>Service entry seals:</b>         | <p>Preformed Visqueen top hats secured with tape. Membrane fitters mentioned to BRD that the use of jubilee clips around the base of the top hats was causing some snagging and they were concerned it was compromising the taped seals. Agreed that if the jubilee clips were causing problems with the seals their use was not paramount.</p>                                                                                                                                                                                                                                                                                                                                  |                                      |                                              |

| VENTILATION                                              |                                                                                                                                           |
|----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Sub-Floor Void:</b>                                   | Open void previously inspected.                                                                                                           |
| <b>External wall air bricks:</b>                         | Periscopic vents and air bricks fitted. Four air brick along each end of the terrace block and six air bricks along front and back walls. |
| <b>Internal sleeper walls:</b>                           | N/A.                                                                                                                                      |
| <b>External vent trenches / ducts or other features:</b> | N/A.                                                                                                                                      |

## Photographs:

**Photo 1** – General view across Plots 901 to 903, looking south east. Note reinforced steel mesh on dedicated supports within the plots.



**Photo 2** – Corner detail. Note pooling of water on the membrane (bottom right of photo) indicating water tight seal.



**Photo 3** – Detail of sealing around top hats which were all to a good standard. Note loose jubilee clip not tightened by the fitters due to concern clips might compromise the taped seal.

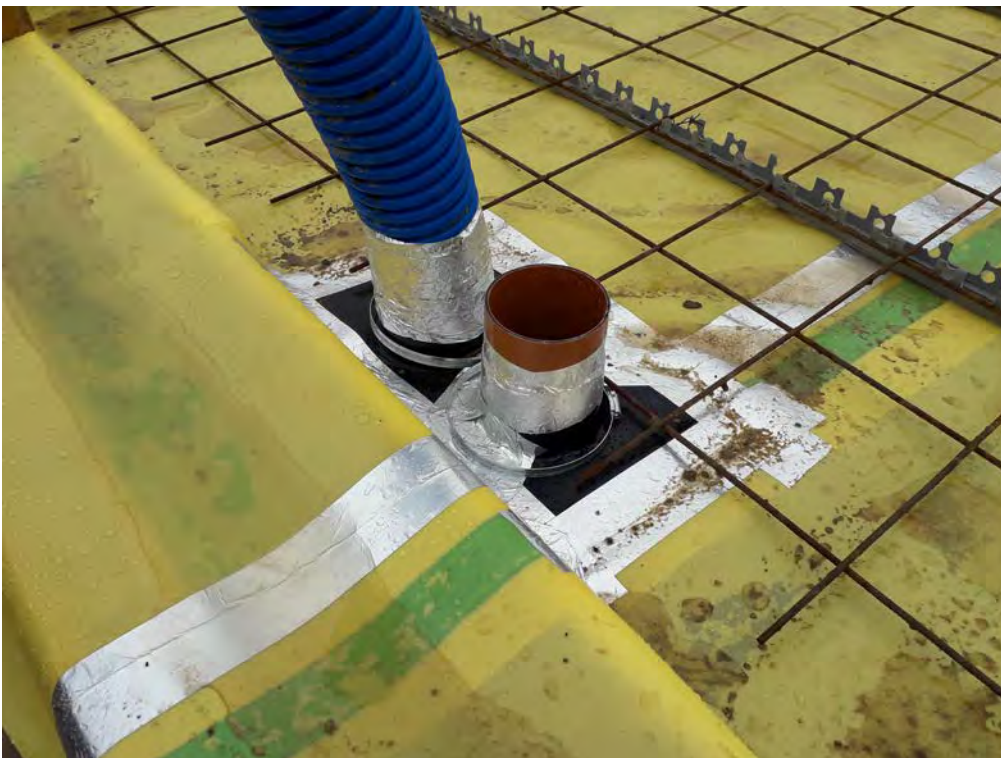


**Photo 4** – Central seam showing evidence of use of a roller on the double sided tape.

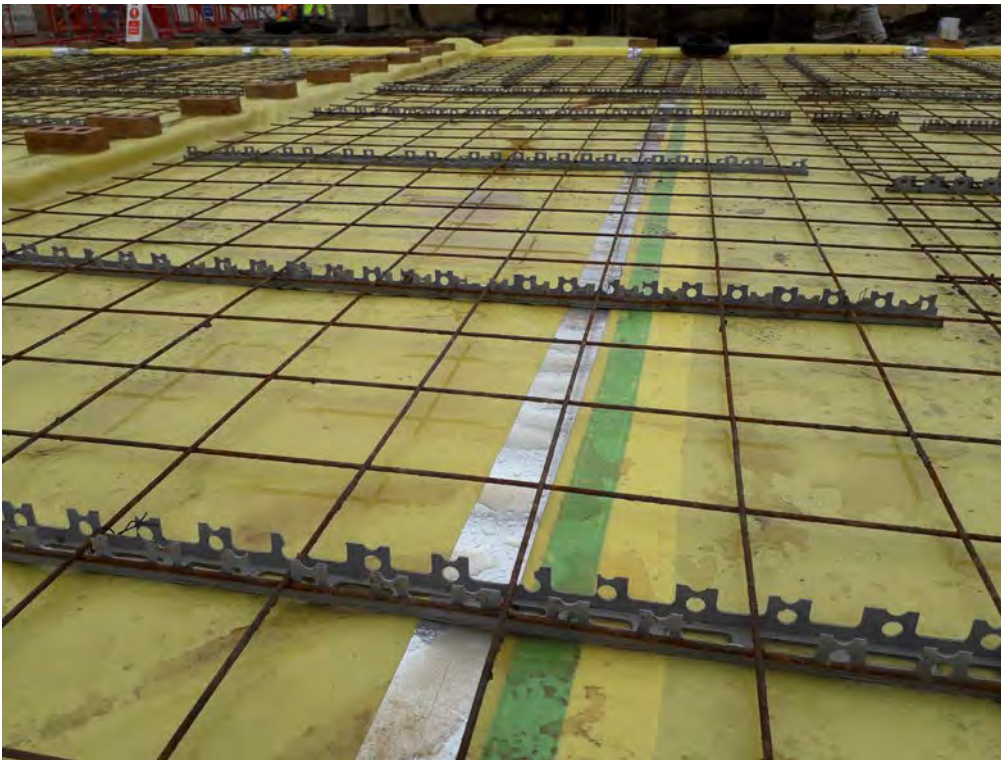


**Photo 5** – Tear in the corner of Plot 901. Note material nearby to enable a repair.



**Photo 6** – Corner of Plot 901 following repair.



**CONCLUSION:**

The gas protection measures for Plots 901 to 903 are acceptable and comply with the specification.

## GAS PROTECTION MEASURES INSPECTION REPORT

|                            |                                     |                                      |                                                             |
|----------------------------|-------------------------------------|--------------------------------------|-------------------------------------------------------------|
| <b>Site:</b>               | POS Area, Wygate Park, Spalding     | <b>Plot(s):</b>                      | Membrane: Plots 905 to 907<br>Air bricks and void: Plot 920 |
| <b>Project No.</b>         | BRD241183                           | <b>Gas Characteristic Situation:</b> | NHBC Amber 1                                                |
| <b>Client:</b>             | Kier Living                         | <b>Development Type:</b>             | Residential                                                 |
| <b>Inspection date:</b>    | 30/10/2019                          | <b>Building Description:</b>         | Traditional Detached or Semi-Detached Houses                |
| <b>Inspection by:</b>      | M Wood                              | <b>Floor Type:</b>                   | Suspended block and beam.                                   |
| <b>Weather Conditions:</b> | Sunny and cool with a slight breeze | <b>Gas Protection Type:</b>          | Passive                                                     |

### GAS MEMBRANE

|                                     |                                                                                                                                                                                                                                                                                                                                                            |
|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Gas Membrane Type:</b>           | Visqueen Low Permeability Gas Membrane.                                                                                                                                                                                                                                                                                                                    |
| <b>Membrane Condition:</b>          | Very good condition with no punctures or tears identified. One patch repair noted.                                                                                                                                                                                                                                                                         |
| <b>Underside of gas membrane:</b>   | Gas membrane placed evenly over insulation. No debris or stress points.                                                                                                                                                                                                                                                                                    |
| <b>Jointing tape product:</b>       | Visqueen Gas Barrier Foil Jointing Tape and Visqueen Double Sided DPM Joining Tape.                                                                                                                                                                                                                                                                        |
| <b>Laps, Welds and joint seals:</b> | Good condition with no significant defects. Minor tearing of tape in three corner seals where the membrane had been lifted by the breeze and put pressure on the corner seal tape. Tears immediately repaired by the fitters and discussed about ensuring sufficient weight is added to the edges of the membrane to prevent this happening in the future. |
| <b>Service entry seals:</b>         | Preformed Visqueen top hats secured with tape.                                                                                                                                                                                                                                                                                                             |

### VENTILATION

|                                  |                                                                                   |
|----------------------------------|-----------------------------------------------------------------------------------|
| <b>Sub-Floor Void:</b>           | Plots 905 to 907: Open void previously inspected.<br>Plot 920: Open void present. |
| <b>External wall air bricks:</b> | Plots 905 to 907: Air bricks and periscopic ducts previously inspected.           |

|                                                          |                                                                                                                                                                                                                                                                                                                                     |
|----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                          | Plot 920: Air bricks and periscopic ducts along two longer walls. Conversation with the site manager revealed that air bricks had not been placed in the shorter two walls as the alignment of the floor beams would restrict flow. Priority was given to create adequate ventilation along unrestricted alignment of longer walls. |
| <b>Internal sleeper walls:</b>                           | N/A.                                                                                                                                                                                                                                                                                                                                |
| <b>External vent trenches / ducts or other features:</b> | N/A.                                                                                                                                                                                                                                                                                                                                |

## Photographs:

**Photo 1** – General view across Plots 905 to 907.



**Photo 2** – Detail of seals around service entry points.



**Photo 3** – Minor tear in corner of corner joint due to wind lifting membrane.



**Photo 4** – Minor tear repaired.



**Photo 5** – Plot 920 showing void, air bricks and periscopic ducts.



**Photo 6** – Close up of interior of Plot 920 showing void and periscopic ducts.



|                    |                                                                                                                                                                                                                                                      |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>CONCLUSION:</b> | <p>The gas protection measures for Plots 905 to 907 are acceptable and comply with the specification.</p> <p>The air bricks, periscopic ducts and voids as inspected in Plot 920 are acceptable at the stage of construction they were observed.</p> |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## GAS PROTECTION MEASURES INSPECTION REPORT

|                            |                                                  |                                      |                                                                              |
|----------------------------|--------------------------------------------------|--------------------------------------|------------------------------------------------------------------------------|
| <b>Site:</b>               | POS Area, Wygate Park, Spalding                  | <b>Plot(s):</b>                      | Membrane: Plots 910/911 (Semi-detached unit)<br>Air bricks: Plot 912/913/914 |
| <b>Project No.</b>         | BRD241183                                        | <b>Gas Characteristic Situation:</b> | NHBC Amber 1                                                                 |
| <b>Client:</b>             | Kier Living                                      | <b>Development Type:</b>             | Residential                                                                  |
| <b>Inspection date:</b>    | 28/11/2019                                       | <b>Building Description:</b>         | Traditional Detached or Semi-Detached Houses                                 |
| <b>Inspection by:</b>      | M Wood                                           | <b>Floor Type:</b>                   | Suspended block and beam                                                     |
| <b>Weather Conditions:</b> | Cold with a slight breeze and heavy rain showers | <b>Gas Protection Type:</b>          | Passive                                                                      |

### GAS MEMBRANE

|                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Gas Membrane Type:</b>           | Visqueen Low Permeability Gas Membrane.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Membrane Condition:</b>          | <p>Very good condition with no punctures or tears identified.</p> <p>Steel mesh was not placed on supporting brackets in this plot. Two areas identified where steel mesh was pressing on the membrane although had not punctured. BRD spoke to the fitter and advised that if brackets are not to be used than care needs to be taken when placing the steel mesh and any pressure points removed by snipping off individual metal prongs. Also advised that the mesh adjacent to the perimeter walls should be flush, i.e. any metal prongs should be removed from the edge of the mesh.</p> |
| <b>Underside of gas membrane:</b>   | Gas membrane placed evenly over insulation. No debris or stress points.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Jointing tape product:</b>       | Visqueen Gas Barrier Foil Jointing Tape and Visqueen Double Sided DPM Joining Tape.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Laps, Welds and joint seals:</b> | <p>Seven defects were identified across the membrane of Plot 910/911 during this inspection.</p> <p>Most of the defects were breaks in the seal of the double sided and silver tape at the point where the membrane laps up and over the edge of the building. BRD marked up all of the defects and informed the fitter who made the necessary repairs whilst BRD were still present. A couple of defects were noted along the central seams where the silver or double sided tape had not been adequately applied or sealed.</p>                                                              |

|                                                          |                                                                                                                           |
|----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
|                                                          | All seven defects repaired and verified.                                                                                  |
| <b>Service entry seals:</b>                              | Preformed Visqueen top hats secured with tape.                                                                            |
| <b>VENTILATION</b>                                       |                                                                                                                           |
| <b>Sub-Floor Void:</b>                                   | Plots 910/911: Open void previously inspected.                                                                            |
| <b>External wall air bricks:</b>                         | Plots 910/911: Air bricks and periscopic ducts previously inspected.<br>Plot 920: Air bricks and periscopic ducts fitted. |
| <b>Internal sleeper walls:</b>                           | N/A.                                                                                                                      |
| <b>External vent trenches / ducts or other features:</b> | N/A.                                                                                                                      |

## Photographs:

**Photo 1** – General view across Plot 910/911.



**Photo 2** – Mesh pressing into membrane and following removal of prongs.

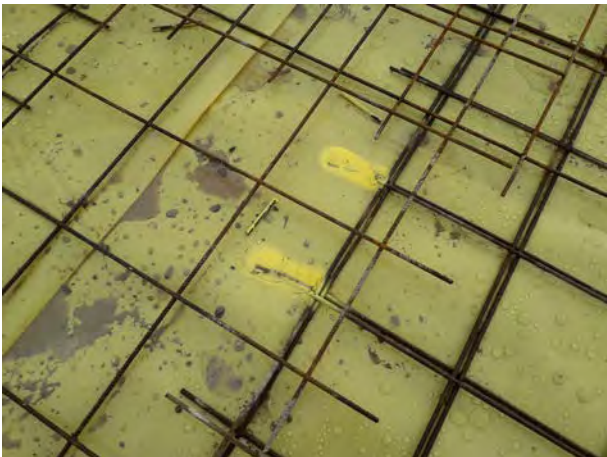
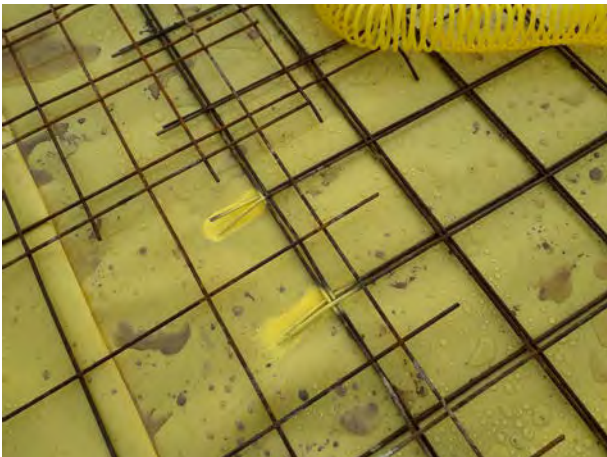


**Photo 3** – Break in seal at lap up onto outer brick wall and following repair.



**Photo 4** – Showing air brick to Plot 912/913/914.



**Photo 5** – Use of air lance testing to check the integrity of the membrane.



**CONCLUSION:**

Following the repairs, the gas protection measures for Plots 910/911 are acceptable and comply with the specification.

The air bricks and periscopic ducts as inspected in Plot 912/913/914 are acceptable at the stage of construction they were observed.

## GAS PROTECTION MEASURES INSPECTION REPORT

|                            |                                 |                                      |                                                                                    |
|----------------------------|---------------------------------|--------------------------------------|------------------------------------------------------------------------------------|
| <b>Site:</b>               | POS Area, Wygate Park, Spalding | <b>Plot(s):</b>                      | Membrane: Plot 912/913/914 & Plot 920<br><br>Air bricks and void: Plot 917/918/919 |
| <b>Project No.</b>         | BRD241183                       | <b>Gas Characteristic Situation:</b> | NHBC Amber 1                                                                       |
| <b>Client:</b>             | Kier Living                     | <b>Development Type:</b>             | Residential                                                                        |
| <b>Inspection date:</b>    | 03/12/2019                      | <b>Building Description:</b>         | Traditional Detached or Semi-Detached Houses                                       |
| <b>Inspection by:</b>      | M Wood                          | <b>Floor Type:</b>                   | Suspended block and beam.                                                          |
| <b>Weather Conditions:</b> | Sunny and cold                  | <b>Gas Protection Type:</b>          | Passive                                                                            |

### GAS MEMBRANE

|                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Gas Membrane Type:</b>           | Visqueen Low Permeability Gas Membrane.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Membrane Condition:</b>          | Very good condition with no punctures or tears identified. One patch repair noted in Plot 912/913/914.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Underside of gas membrane:</b>   | Gas membrane placed evenly over insulation. No debris or stress points.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Jointing tape product:</b>       | Visqueen Gas Barrier Foil Jointing Tape and Visqueen Double Sided DPM Joining Tape.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Laps, Welds and joint seals:</b> | <p>Plot 912/913/914: Good condition with no significant defects. Three minor defects noted across the membrane. Two defects were associated with the silver tape seal around two top hats. The silver tape had spilt, exposing the black top hat beneath. A replacement strip of silver tape was applied by the fitter. The third defect was a break in the seal in both the double sided and silver tape at the end of one seam. This was also repaired by the fitter.</p> <p>Steel mesh had been snipped around the edges as suggested by BRD during the previous inspection visit.</p> <p>Plot 920: Good condition with no defects at the time of installation. BRD observed the fitter placing the double sided tape across the entirety of the membrane and confirmed it had been adequately sealed.</p> |
| <b>Service entry seals:</b>         | Preformed Visqueen top hats secured with tape.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

| VENTILATION                                              |                                                                                                                                                                                                                                                                                             |
|----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Sub-Floor Void:</b>                                   | <p>Plot 912/913/914: Open void not previously inspected but will have been done to the same standard as all other plots inspected.</p> <p>Plot 920: Open void previously inspected.</p> <p>Plot 917/918/919: Open void present.</p>                                                         |
| <b>External wall air bricks:</b>                         | <p>Plot 912/913/914: Air bricks and periscopic ducts present along all external walls.</p> <p>Plot 920: Air bricks and periscopic ducts previously inspected.</p> <p>Plot 917/918/919: Two air bricks and ducts had been installed at the time of the inspection (works still ongoing).</p> |
| <b>Internal sleeper walls:</b>                           | N/A.                                                                                                                                                                                                                                                                                        |
| <b>External vent trenches / ducts or other features:</b> | N/A.                                                                                                                                                                                                                                                                                        |

## Photographs:

**Photo 1** – General view across Plot 912/913/914.



**Photo 2** – Air lance testing of membrane to Plot 912/913/914.



**Photo 3** – Minor tear in silver tape around top hat before and after repair.

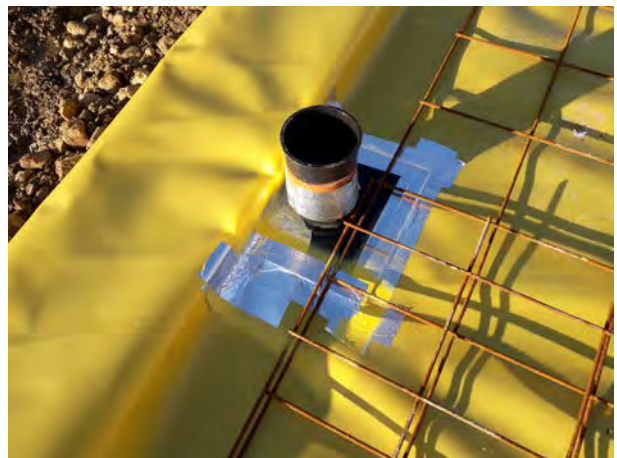
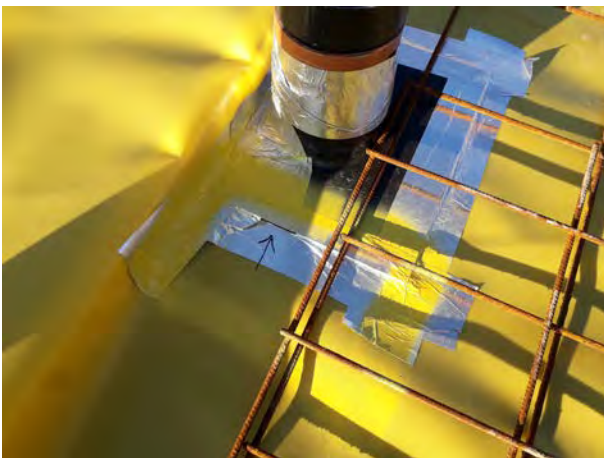


**Photo 4** – Break in seal at end of membrane seam before and after repair.

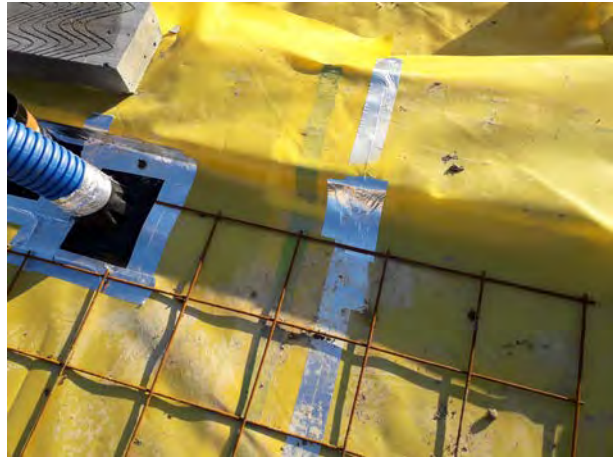
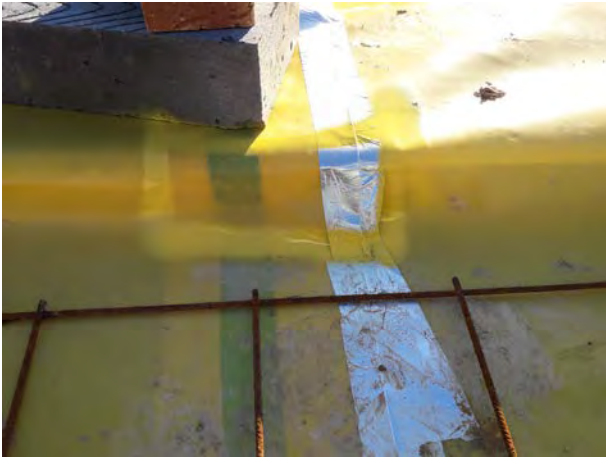


**Photo 5** – Snipped edges of steel mesh along perimeter.

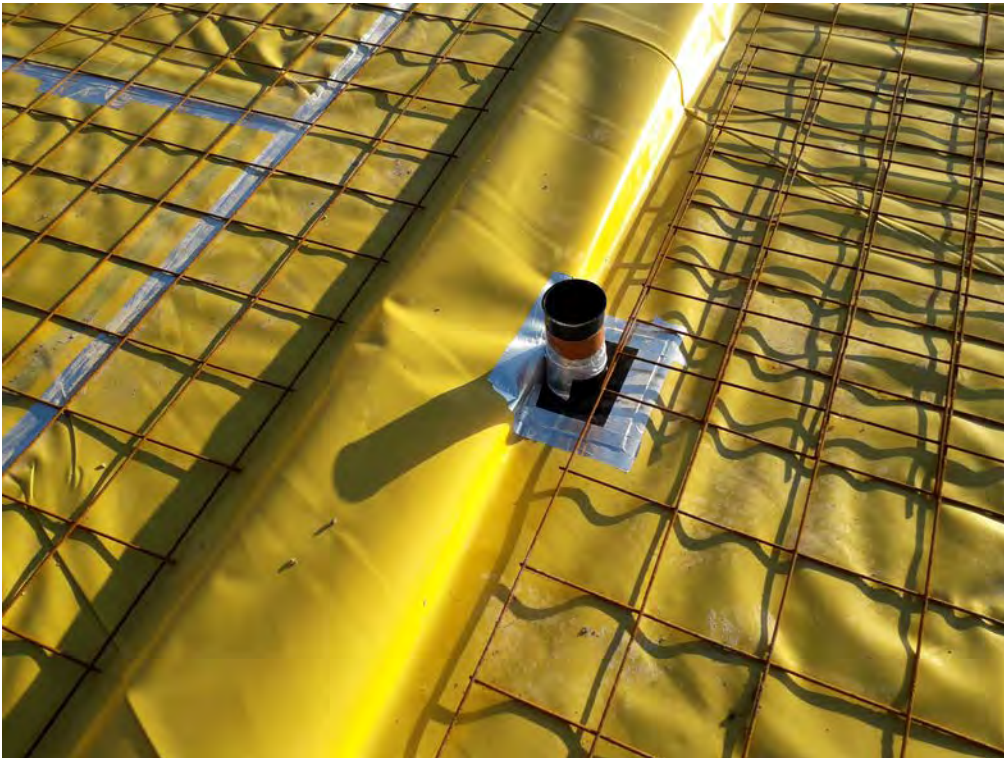


**Photo 6** – Void to Plot 917/918/919.



**Photo 7** – Plot 920 showing ongoing installation of membrane.



**CONCLUSION:**

The gas protection measures for Plot 912/913/914 and Plot 920 are acceptable and comply with the specification.

The air bricks, periscopic ducts and voids as inspected in Plot 917/918/919 are acceptable at the stage of construction they were observed.

## GAS PROTECTION MEASURES INSPECTION REPORT

|                            |                                    |                                      |                                                                           |
|----------------------------|------------------------------------|--------------------------------------|---------------------------------------------------------------------------|
| <b>Site:</b>               | POS Area, Wygate Park, Spalding    | <b>Plot(s):</b>                      | Membrane: Plots 915 & 916 (detached plots)<br>Air bricks: Plots 915 & 916 |
| <b>Project No.</b>         | BRD241183                          | <b>Gas Characteristic Situation:</b> | NHBC Amber 1                                                              |
| <b>Client:</b>             | Kier Living                        | <b>Development Type:</b>             | Residential                                                               |
| <b>Inspection date:</b>    | 29/01/2020                         | <b>Building Description:</b>         | Semi-Detached Houses                                                      |
| <b>Inspection by:</b>      | M Morgan                           | <b>Floor Type:</b>                   | Suspended block and beam                                                  |
| <b>Weather Conditions:</b> | Overcast, cold and slightly breezy | <b>Gas Protection Type:</b>          | Passive                                                                   |

### GAS MEMBRANE

|                                     |                                                                                                                                                                                |
|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Gas Membrane Type:</b>           | Visqueen Low Permeability Gas Membrane.                                                                                                                                        |
| <b>Membrane Condition:</b>          | Generally good condition with 1No. tear identified which was a result of the mesh poking through the membrane. Tear repaired using silver tape by fitter and confirmed by BRD. |
| <b>Underside of gas membrane:</b>   | Gas membrane placed evenly over insulation. No debris or stress points.                                                                                                        |
| <b>Jointing tape product:</b>       | Visqueen Gas Barrier Foil Jointing Tape and Visqueen Double Sided DPM Joining Tape.                                                                                            |
| <b>Laps, Welds and joint seals:</b> | Relatively good condition with 3No. minor defects around the corner joints. Additional silver tape was applied by the fitter and the seal confirmed by BRD.                    |
| <b>Service entry seals:</b>         | Preformed Visqueen top hats secured with tape.                                                                                                                                 |

### VENTILATION

|                                  |                                                                                                                                                                     |
|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Sub-Floor Void:</b>           | Plots 915 & 916: Open void not previously inspected but numerous other voids on site have been inspected to confirm this aspect is being undertaken satisfactorily. |
| <b>External wall air bricks:</b> | Plots 915 & 916: Suitable quantity of air bricks and periscopic ducts present along all external walls.                                                             |

|                                                          |      |
|----------------------------------------------------------|------|
| <b>Internal sleeper walls:</b>                           | N/A. |
| <b>External vent trenches / ducts or other features:</b> | N/A. |

## Photographs:

**Photo 1** – General view across Plots 915 (background) & 916 (foreground).



**Photo 2** – Membrane of Plot 916.



**Photo 3** - Detail of tape seals around service entry point.

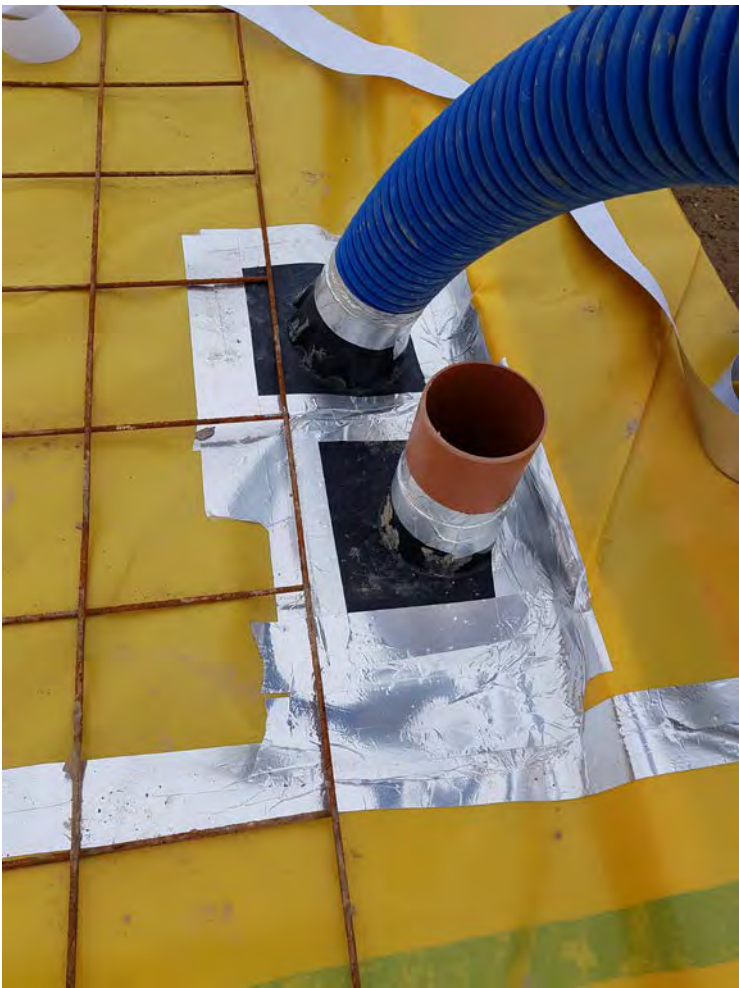


**Photo 4** - Defect around top hat before repair.



**CONCLUSION:**

The gas protection measures for Plots 915 & 916 are acceptable and comply with the specification.

**Table 1** – Progress of Gas Protection Measures Inspections

| PLOTS           | STATUS                                                                                                                   |
|-----------------|--------------------------------------------------------------------------------------------------------------------------|
| 901/902/903     | Inspected and verified by BRD – 25/10/2019                                                                               |
| 904             | Inspected and verified by BRD – 09/10/2019                                                                               |
| 905/906/907     | Inspected and verified by BRD – 30/10/2019                                                                               |
| 908/909         | Groundworker contractor to provide statement and photographic evidence of successful fitting of gas protection measures. |
| 910/911         | Inspected and verified by BRD – 28/11/2019                                                                               |
| 912/913/914     | Inspected and verified by BRD – 03/12/2019                                                                               |
| 915             | Inspected and verified by BRD – 29/01/2020                                                                               |
| 916             | Inspected and verified by BRD – 29/01/2020                                                                               |
| 917/918/919     | Groundworker contractor to provide statement and photographic evidence of successful fitting of gas protection measures. |
| 920             | Partially inspected and verified by BRD – 03/12/2019                                                                     |
| 921/922         | Plot not ready for inspection                                                                                            |
| 923 (Stairwell) | Plot not ready for inspection                                                                                            |
| 924/925         | Plot not ready for inspection                                                                                            |
| 926 (Stairwell) | Plot not ready for inspection                                                                                            |
| 927/928/929     | Plot not ready for inspection                                                                                            |
| 930/931/932     | Plot not ready for inspection                                                                                            |
| 933/934         | Plot not ready for inspection                                                                                            |

## GAS PROTECTION MEASURES INSPECTION REPORT

|                            |                                 |                                      |                                                     |
|----------------------------|---------------------------------|--------------------------------------|-----------------------------------------------------|
| <b>Site:</b>               | POS Area, Wygate Park, Spalding | <b>Plot(s):</b>                      | Membrane: Plot 921/922<br>Air bricks: Plots 921/922 |
| <b>Project No.</b>         | BRD241183                       | <b>Gas Characteristic Situation:</b> | NHBC Amber 1                                        |
| <b>Client:</b>             | Kier Living                     | <b>Development Type:</b>             | Residential                                         |
| <b>Inspection date:</b>    | 12/02/2020                      | <b>Building Description:</b>         | Semi-Detached Houses                                |
| <b>Inspection by:</b>      | M Wood                          | <b>Floor Type:</b>                   | Suspended block and beam.                           |
| <b>Weather Conditions:</b> | Sunny, cold and slightly windy  | <b>Gas Protection Type:</b>          | Passive                                             |

### GAS MEMBRANE

|                                     |                                                                                                                                                                                                                                                                       |
|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Gas Membrane Type:</b>           | Visqueen Low Permeability Gas Membrane.                                                                                                                                                                                                                               |
| <b>Membrane Condition:</b>          | Very good condition with no punctures or tears identified. Four patch repairs noted.                                                                                                                                                                                  |
| <b>Underside of gas membrane:</b>   | Gas membrane placed evenly over insulation. No debris or stress points.                                                                                                                                                                                               |
| <b>Jointing tape product:</b>       | Visqueen Gas Barrier Foil Jointing Tape and Visqueen Double Sided DPM Joining Tape.                                                                                                                                                                                   |
| <b>Laps, Welds and joint seals:</b> | Good condition with no significant defects. One minor defect noted where the silver tape had become loose around one edge of a top hat. Additional silver tape was applied by the fitter and the seal confirmed by BRD. Steel mesh had been snipped around the edges. |
| <b>Service entry seals:</b>         | Preformed Visqueen top hats secured with tape.                                                                                                                                                                                                                        |

### VENTILATION

|                                  |                                                                                                                             |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| <b>Sub-Floor Void:</b>           | Plot 921/922: Open void not previously inspected but will have been done to the same standard as all other plots inspected. |
| <b>External wall air bricks:</b> | Plot 921/922: Air bricks and periscopic ducts present along all external walls.                                             |
| <b>Internal sleeper walls:</b>   | N/A.                                                                                                                        |

|                                                   |      |
|---------------------------------------------------|------|
| External vent trenches / ducts or other features: | N/A. |
|---------------------------------------------------|------|

## Photographs:

**Photo 1** – General view across Plot 921/922.



**Photo 2** – Air lance testing of membrane to Plot 921/922.



**Photo 3** – Detail of tape seals around a corner joint and top hat.

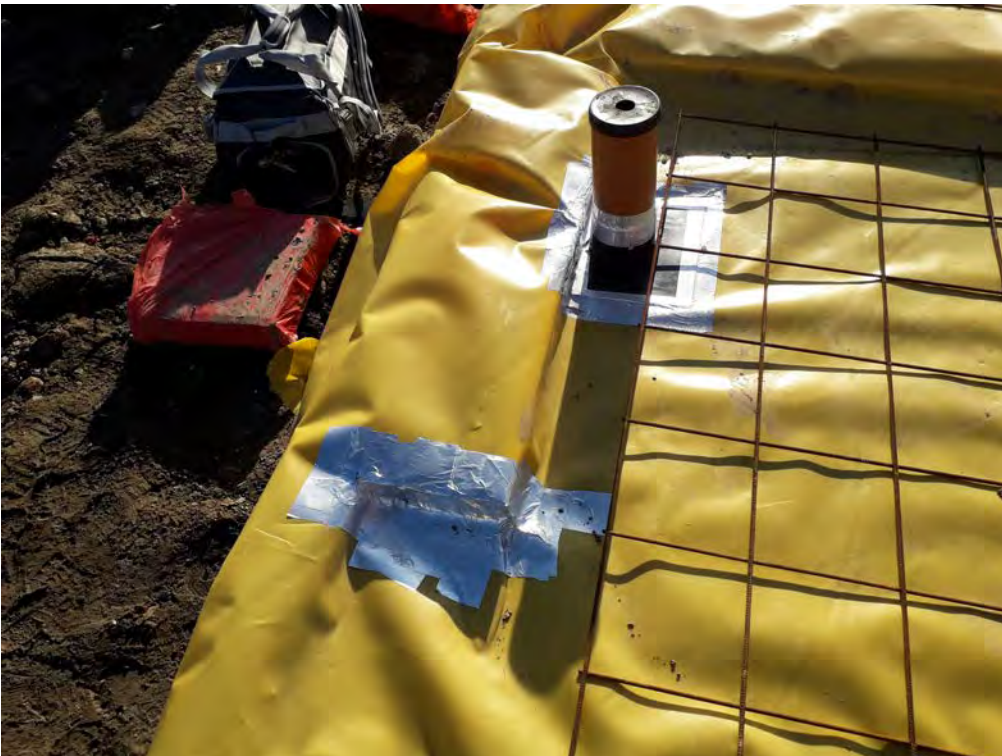


**Photo 4** – Break in seal at top hat before and after repair.

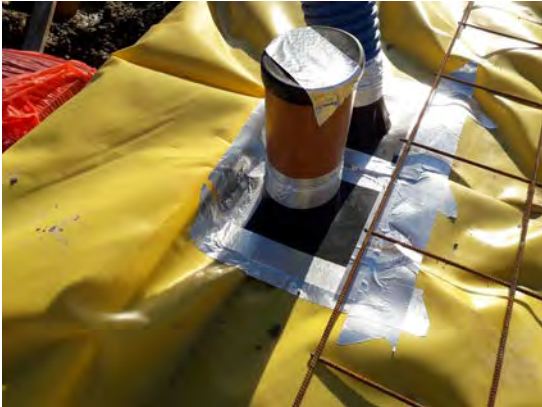
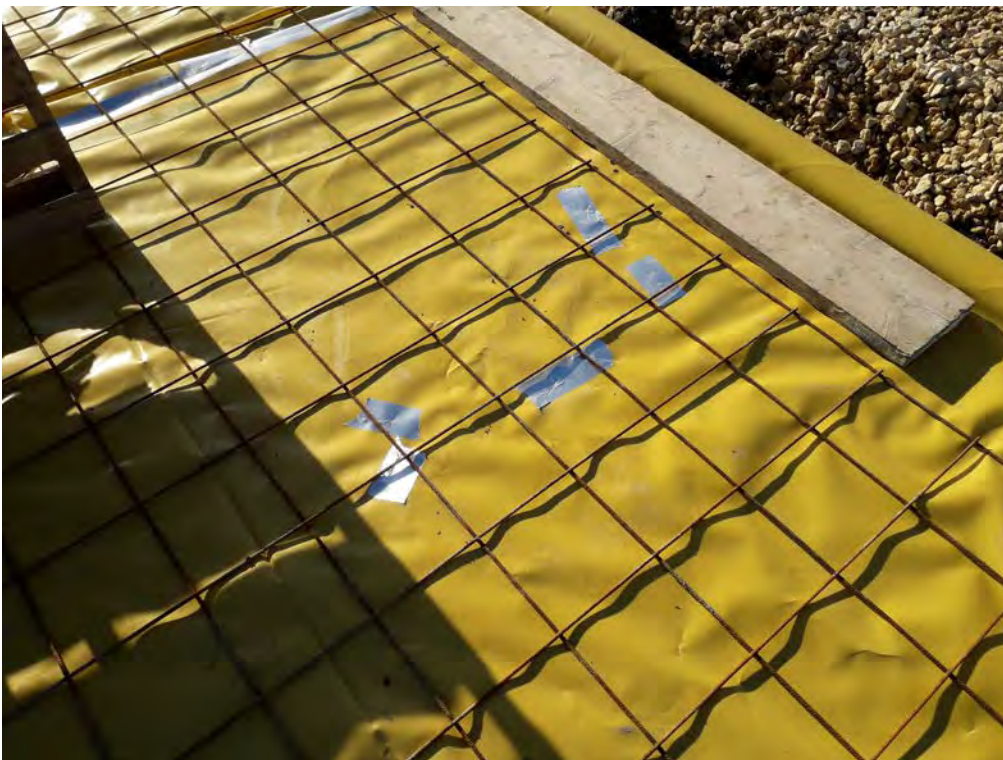


**Photo 5** – Patch repairs on the membrane placed prior to the inspection visit.



**CONCLUSION:**

The gas protection measures for Plot 921/922 are acceptable and comply with the specification.

**Table 1** – Progress of Gas Protection Measures Inspections

| PLOTS           | STATUS                                                                                                                   |
|-----------------|--------------------------------------------------------------------------------------------------------------------------|
| 901/902/903     | Inspected and verified by BRD – 25/10/2019                                                                               |
| 904             | Inspected and verified by BRD – 09/10/2019                                                                               |
| 905/906/907     | Inspected and verified by BRD – 30/10/2019                                                                               |
| 908/909         | Groundworker contractor to provide statement and photographic evidence of successful fitting of gas protection measures. |
| 910/911         | Inspected and verified by BRD – 28/11/2019                                                                               |
| 912/913/914     | Inspected and verified by BRD – 03/12/2019                                                                               |
| 915             | Inspected and verified by BRD – 29/01/2020                                                                               |
| 916             | Inspected and verified by BRD – 29/01/2020                                                                               |
| 917/918/919     | Groundworker contractor to provide statement and photographic evidence of successful fitting of gas protection measures. |
| 920             | Partially inspected and verified by BRD – 03/12/2019                                                                     |
| 921/922         | Inspected and verified by BRD – 12/02/2020                                                                               |
| 923 (Stairwell) | Plot not ready for inspection                                                                                            |
| 924/925         | Plot not ready for inspection                                                                                            |
| 926 (Stairwell) | Plot not ready for inspection                                                                                            |
| 927/928/929     | Plot not ready for inspection                                                                                            |
| 930/931/932     | Plot not ready for inspection                                                                                            |
| 933/934         | Plots not ready for inspection                                                                                           |

## GAS PROTECTION MEASURES INSPECTION REPORT

|                            |                                 |                                      |                                                                                                              |
|----------------------------|---------------------------------|--------------------------------------|--------------------------------------------------------------------------------------------------------------|
| <b>Site:</b>               | POS Area, Wygate Park, Spalding | <b>Plot(s):</b>                      | Membrane: Plot 924/925<br>Stairwells to Plots 923 & 926 (flats over garages)<br>Air Bricks: Plot 927/928/929 |
| <b>Project No.</b>         | BRD241183                       | <b>Gas Characteristic Situation:</b> | NHBC Amber 1                                                                                                 |
| <b>Client:</b>             | Kier Living                     | <b>Development Type:</b>             | Residential                                                                                                  |
| <b>Inspection date:</b>    | 11/03/2020                      | <b>Building Description:</b>         | Semi-Detached Houses                                                                                         |
| <b>Inspection by:</b>      | M Morgan                        | <b>Floor Type:</b>                   | Suspended block and beam.                                                                                    |
| <b>Weather Conditions:</b> | Sunny, cold and slightly windy  | <b>Gas Protection Type:</b>          | Passive                                                                                                      |

### GAS MEMBRANE

|                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Gas Membrane Type:</b>           | Visqueen Low Permeability Gas Membrane.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Membrane Condition:</b>          | Plots 924/925: Very good condition with no punctures or tears identified.<br>Plots 923 & 926: Very good condition with no punctures or tears identified.                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Underside of gas membrane:</b>   | Gas membrane placed evenly over insulation. No debris or stress points.                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Jointing tape product:</b>       | Visqueen Gas Barrier Foil Jointing Tape and Visqueen Double Sided DPM Joining Tape.                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Laps, Welds and joint seals:</b> | Plots 924/925: Good condition with no significant defects. Two minor defects noted where the silver tape had become loose around one edge of a top hat. Additional silver tape was applied by the fitter and the seal confirmed by BRD.<br>Plot 923: Good condition with one small hole in silver tape identified. Additional silver tape applied by fitter and confirmed by BRD.<br>Plot 926: Three minor defects identified around corner joints where tape had come loose. Additional silver tape applied by the fitter and confirmed by BRD. |
| <b>Service entry seals:</b>         | Preformed Visqueen top hats secured with tape.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

| VENTILATION                                              |                                                                                                                                                                                                                                                              |
|----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Sub-Floor Void:</b>                                   | Plot 924/925: Open void not previously inspected but BRD have witnessed that sufficient voids are present on other plots.                                                                                                                                    |
| <b>External wall air bricks:</b>                         | Plot 924/925: Air bricks and periscopic ducts present along all external walls.<br>Plots 923 & 926: Air bricks and periscopic ducts present along all external walls.<br>Plot 927/928/929: Air bricks and periscopic ducts present along all external walls. |
| <b>Internal sleeper walls:</b>                           | N/A.                                                                                                                                                                                                                                                         |
| <b>External vent trenches / ducts or other features:</b> | N/A.                                                                                                                                                                                                                                                         |

## Photographs:

**Photo 1** – General view across Plot 924/925.



**Photo 2** – Minor defect in silver tape seal along fold of membrane to Plot 924/925.



**Photo 3** – View of membrane to stairwell of Plot 923. Note air lance used during verification.



**Photo 4** – View of corner detail for Plot 923.



**Photo 5** – Minor defect on tape seal for Plot 923.



**Photo 6** – General view of Plot 926.



**Photo 7** – Corner detailing for Plot 926, note three identified defects within silver tape corner seal.



**Photo 8** – Detail of defects identified in seal for Plot 926.



**CONCLUSION:**

Following the repair of all identified defects, the gas protection measures for Plot 924/925 and the stairwells to Plots 923 and 926 are acceptable and comply with the specification.

**Table 1** – Progress of Gas Protection Measures Inspections

| PLOTS           | STATUS                                                                                                                   |
|-----------------|--------------------------------------------------------------------------------------------------------------------------|
| 901/902/903     | Inspected and verified by BRD – 25/10/2019                                                                               |
| 904             | Inspected and verified by BRD – 09/10/2019                                                                               |
| 905/906/907     | Inspected and verified by BRD – 30/10/2019                                                                               |
| 908/909         | Groundworker contractor to provide statement and photographic evidence of successful fitting of gas protection measures. |
| 910/911         | Inspected and verified by BRD – 28/11/2019                                                                               |
| 912/913/914     | Inspected and verified by BRD – 03/12/2019                                                                               |
| 915             | Inspected and verified by BRD – 29/01/2020                                                                               |
| 916             | Inspected and verified by BRD – 29/01/2020                                                                               |
| 917/918/919     | Groundworker contractor to provide statement and photographic evidence of successful fitting of gas protection measures. |
| 920             | Partially inspected and verified by BRD – 03/12/2019                                                                     |
| 921/922         | Inspected and verified by BRD – 12/02/2020                                                                               |
| 923 (Stairwell) | Inspected and verified by BRD – 11/03/2020                                                                               |
| 924/925         | Inspected and verified by BRD – 11/03/2020                                                                               |
| 926 (Stairwell) | Inspected and verified by BRD – 11/03/2020                                                                               |
| 927/928/929     | Plot not ready for inspection                                                                                            |
| 930/931/932     | Plot not ready for inspection                                                                                            |
| 933/934         | Plot not ready for inspection                                                                                            |

## GAS PROTECTION MEASURES INSPECTION REPORT

|                                     |                                                                                                                                                                                                                                                                                                                                                                                                        |                                      |                                                                                                                  |
|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|------------------------------------------------------------------------------------------------------------------|
| <b>Site:</b>                        | POS Area, Wygate Park, Spalding                                                                                                                                                                                                                                                                                                                                                                        | <b>Plot(s):</b>                      | Membrane: Plot 927/928/929<br><br>Air Bricks: Plot 930/931/932 & 933/934<br><br>Sub-floor void: Plot 930/931/932 |
| <b>Project No.</b>                  | BRD241183                                                                                                                                                                                                                                                                                                                                                                                              | <b>Gas Characteristic Situation:</b> | NHBC Amber 1                                                                                                     |
| <b>Client:</b>                      | Kier Living                                                                                                                                                                                                                                                                                                                                                                                            | <b>Development Type:</b>             | Residential                                                                                                      |
| <b>Inspection date:</b>             | 24/03/2020                                                                                                                                                                                                                                                                                                                                                                                             | <b>Building Description:</b>         | Semi-Detached Houses                                                                                             |
| <b>Inspection by:</b>               | M Wood                                                                                                                                                                                                                                                                                                                                                                                                 | <b>Floor Type:</b>                   | Suspended block and beam.                                                                                        |
| <b>Weather Conditions:</b>          | Sunny and warm                                                                                                                                                                                                                                                                                                                                                                                         | <b>Gas Protection Type:</b>          | Passive                                                                                                          |
| <b>GAS MEMBRANE</b>                 |                                                                                                                                                                                                                                                                                                                                                                                                        |                                      |                                                                                                                  |
| <b>Gas Membrane Type:</b>           | Visqueen Low Permeability Gas Membrane.                                                                                                                                                                                                                                                                                                                                                                |                                      |                                                                                                                  |
| <b>Membrane Condition:</b>          | <p>Plots 927/928/929: Generally very good condition with five minor punctures identified. The punctures were due to metal ties used on the steel mesh poking into the membrane. All punctures patched with silver tape by the fitter and the seal confirmed by BRD.</p> <p>BRD mentioned to the fitter to ensure that the metal ties are snipped or removed in future to avoid possible punctures.</p> |                                      |                                                                                                                  |
| <b>Underside of gas membrane:</b>   | Gas membrane placed evenly over insulation. No debris or stress points.                                                                                                                                                                                                                                                                                                                                |                                      |                                                                                                                  |
| <b>Jointing tape product:</b>       | Visqueen Gas Barrier Foil Jointing Tape and Visqueen Double Sided DPM Joining Tape.                                                                                                                                                                                                                                                                                                                    |                                      |                                                                                                                  |
| <b>Laps, Welds and joint seals:</b> | Plot 927/928/929: Good condition with no significant defects. One minor defects noted where the silver tape had torn on a corner joint. Additional silver tape was applied by the fitter and the seal confirmed by BRD.                                                                                                                                                                                |                                      |                                                                                                                  |
| <b>Service entry seals:</b>         | Preformed Visqueen top hats secured with tape.                                                                                                                                                                                                                                                                                                                                                         |                                      |                                                                                                                  |

| VENTILATION                                              |                                                                                                                                                                                                                                     |
|----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Sub-Floor Void:</b>                                   | Plot 930/931/932: Open void present.<br>Plot 927/928/929 & Plot 933/934: Open void not inspected but BRD have witnessed that sufficient voids are present on other plots.                                                           |
| <b>External wall air bricks:</b>                         | Plot 927/928/929: Air bricks and periscopic ducts present along all external walls as confirmed on the previous inspection visit.<br>Plots 930/931/932 & 933/934: Air bricks and periscopic ducts present along all external walls. |
| <b>Internal sleeper walls:</b>                           | N/A.                                                                                                                                                                                                                                |
| <b>External vent trenches / ducts or other features:</b> | N/A.                                                                                                                                                                                                                                |

## Photographs:

**Photo 1** - General view across Plot 927/928/929.



**Photo 2** - General view of Plot 930/931/932 showing sub-floor void and air brick.



**Photo 3** - General view of Plot 933/934 showing air brick along external walls.



**Photo 4** - Example of minor puncture holes in the membrane of Plot 927/928/929, before and after repair.

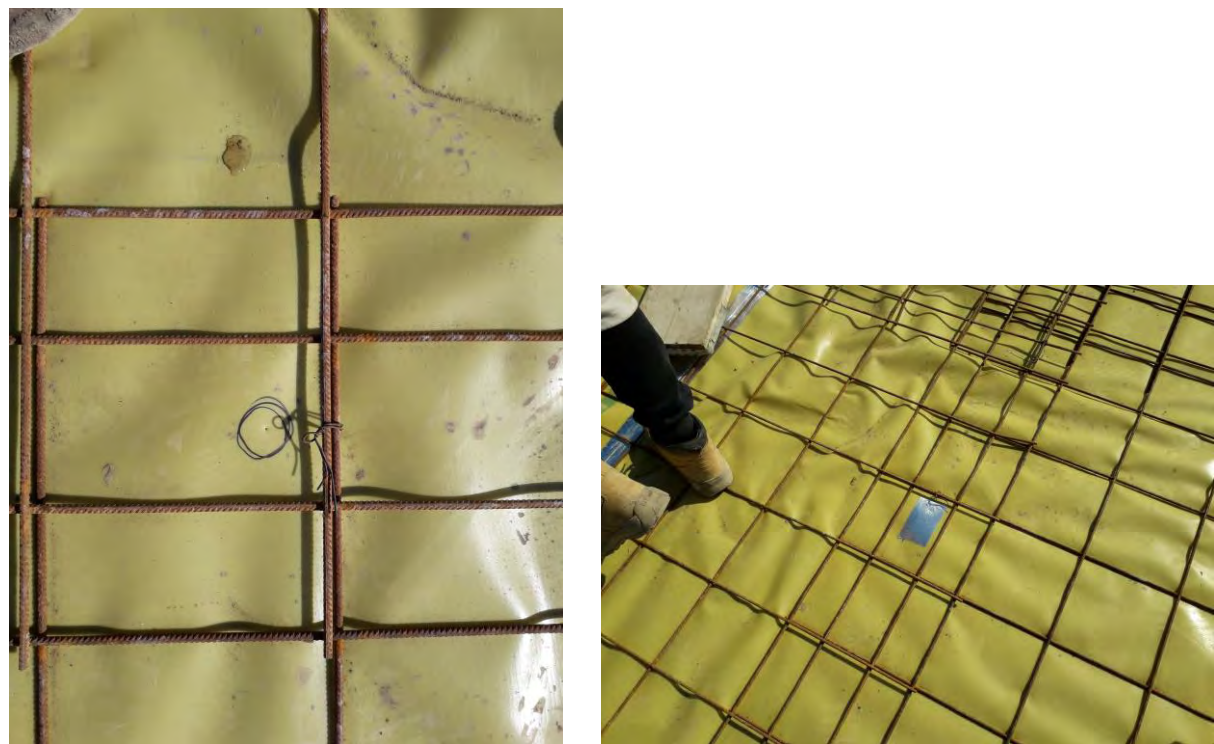


**Photo 5** - Tear in silver tape within a corner joint before and after repair.



|                    |                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>CONCLUSION:</b> | <p>Following the repair of all identified defects, the gas protection measures for Plot 927/928/929 are acceptable and comply with the specification.</p> <p>The air bricks and periscopic ducts as inspected in Plots 930/931/932 and 933/934 are acceptable at the stage of construction these were observed.</p> <p>The sub-floor void as inspected in Plot 930/931/932 is acceptable.</p> |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Table 1** - Progress of Gas Protection Measures Inspections

| PLOTS           | STATUS                                                                                                                   |
|-----------------|--------------------------------------------------------------------------------------------------------------------------|
| 901/902/903     | Inspected and verified by BRD - 25/10/2019                                                                               |
| 904             | Inspected and verified by BRD - 09/10/2019                                                                               |
| 905/906/907     | Inspected and verified by BRD - 30/10/2019                                                                               |
| 908/909         | Groundworker contractor to provide statement and photographic evidence of successful fitting of gas protection measures. |
| 910/911         | Inspected and verified by BRD - 28/11/2019                                                                               |
| 912/913/914     | Inspected and verified by BRD - 03/12/2019                                                                               |
| 915             | Inspected and verified by BRD - 29/01/2020                                                                               |
| 916             | Inspected and verified by BRD - 29/01/2020                                                                               |
| 917/918/919     | Groundworker contractor to provide statement and photographic evidence of successful fitting of gas protection measures. |
| 920             | Partially inspected and verified by BRD - 03/12/2019                                                                     |
| 921/922         | Inspected and verified by BRD - 12/02/2020                                                                               |
| 923 (Stairwell) | Inspected and verified by BRD - 11/03/2020                                                                               |
| 924/925         | Inspected and verified by BRD - 11/03/2020                                                                               |
| 926 (Stairwell) | Inspected and verified by BRD - 11/03/2020                                                                               |
| 927/928/929     | Inspected and verified by BRD - 24/03/2020                                                                               |
| 930/931/932     | Plot not ready for full inspection                                                                                       |
| 933/934         | Plot not ready for full inspection                                                                                       |

## GAS PROTECTION MEASURES INSPECTION REPORT

|                                     |                                                                                                                                                               |                                      |                            |
|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|----------------------------|
| <b>Site:</b>                        | POS Area, Wygate Park, Spalding                                                                                                                               | <b>Plot(s):</b>                      | Membrane: Plot 930/931/932 |
| <b>Project No.</b>                  | BRD241183                                                                                                                                                     | <b>Gas Characteristic Situation:</b> | NHBC Amber 1               |
| <b>Client:</b>                      | Kier Living                                                                                                                                                   | <b>Development Type:</b>             | Residential                |
| <b>Inspection date:</b>             | 10/08/2020                                                                                                                                                    | <b>Building Description:</b>         | Terraced Houses            |
| <b>Inspection by:</b>               | M Morgan                                                                                                                                                      | <b>Floor Type:</b>                   | Suspended block and beam   |
| <b>Weather Conditions:</b>          | Hot and sunny                                                                                                                                                 | <b>Gas Protection Type:</b>          | Passive                    |
| <b>GAS MEMBRANE</b>                 |                                                                                                                                                               |                                      |                            |
| <b>Gas Membrane Type:</b>           | Visqueen Low Permeability Gas Membrane.                                                                                                                       |                                      |                            |
| <b>Membrane Condition:</b>          | Generally very good condition with one minor puncture identified which was patched with silver tape by the fitter and the seal confirmed by BRD.              |                                      |                            |
| <b>Underside of gas membrane:</b>   | Gas membrane placed evenly over insulation. No debris or stress points.                                                                                       |                                      |                            |
| <b>Jointing tape product:</b>       | Visqueen Gas Barrier Foil Jointing Tape and Visqueen Double Sided DPM Joining Tape.                                                                           |                                      |                            |
| <b>Laps, Welds and joint seals:</b> | Good condition with no significant defects. Due to the heat some of the tape had lost adhesion but additional pressure on the tape allowed it to be resealed. |                                      |                            |
| <b>Service entry seals:</b>         | Preformed Visqueen top hats secured with tape.                                                                                                                |                                      |                            |

| VENTILATION                                              |                                                                                                                 |
|----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| <b>Sub-Floor Void:</b>                                   | Plot 930/931/932: Open void previously confirmed to be present.                                                 |
| <b>External wall air bricks:</b>                         | Plots 930/931/932: Air bricks and periscopic ducts previously confirmed to be present along all external walls. |
| <b>Internal sleeper walls:</b>                           | N/A.                                                                                                            |
| <b>External vent trenches / ducts or other features:</b> | N/A.                                                                                                            |

## Photographs:

**Photo 1** - General view across Plot 930/931/932.



**Photo 2** - Corner detail of the membrane.

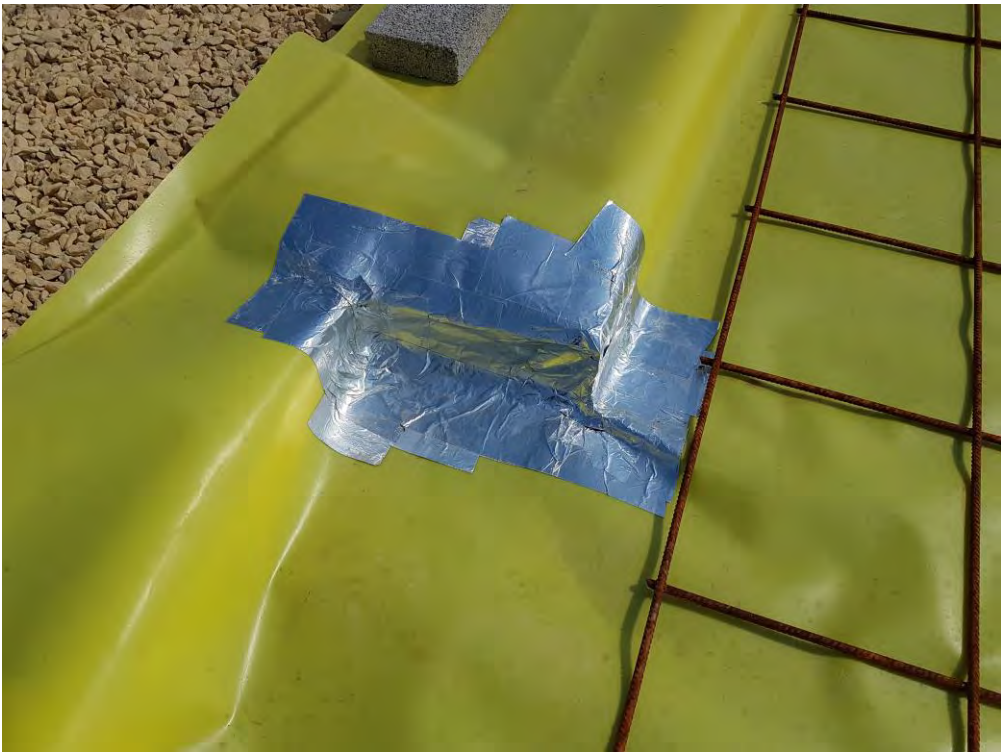


**Photo 3** - Corner detail and seal around service entry point.

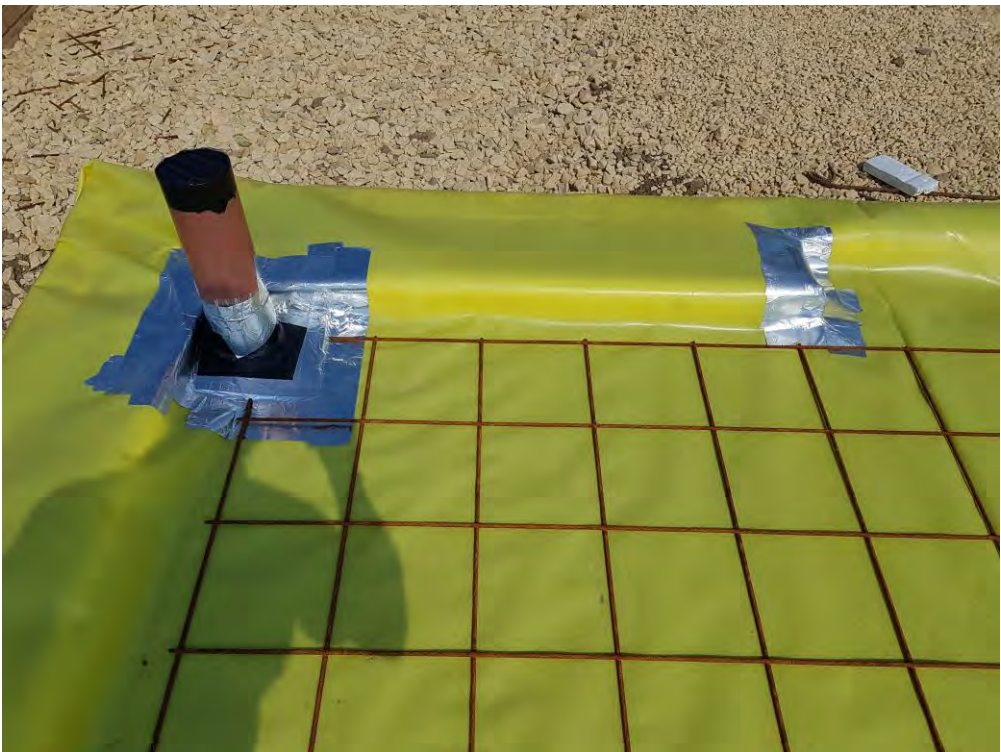
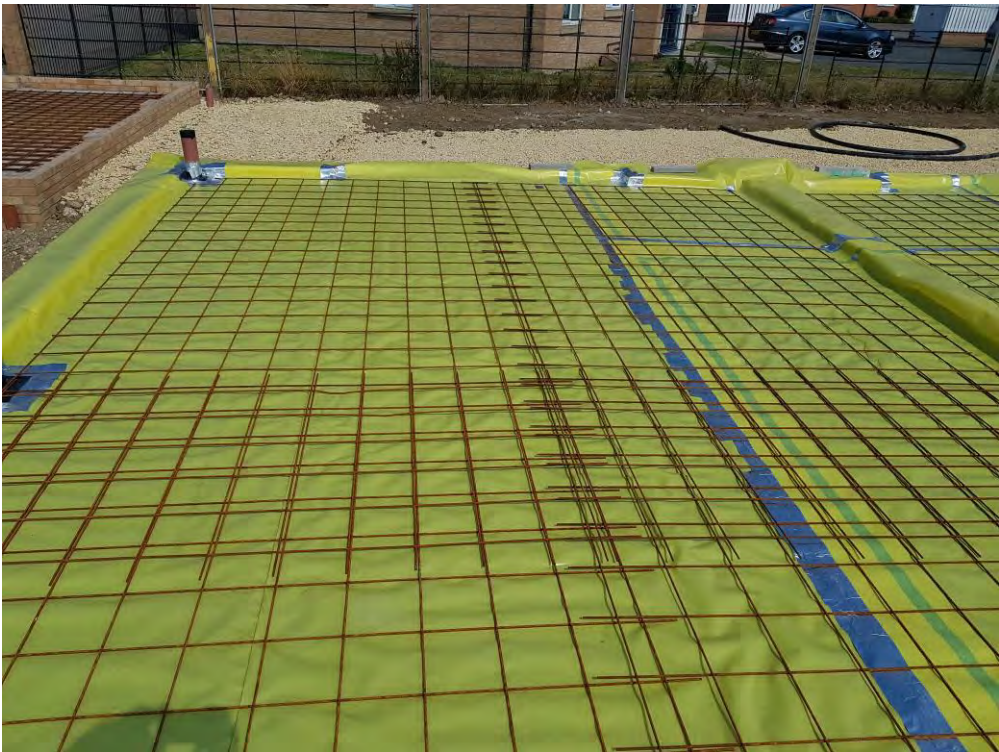


**Photo 4** - Looking across the membrane showing lap joint and placement of steel mesh.



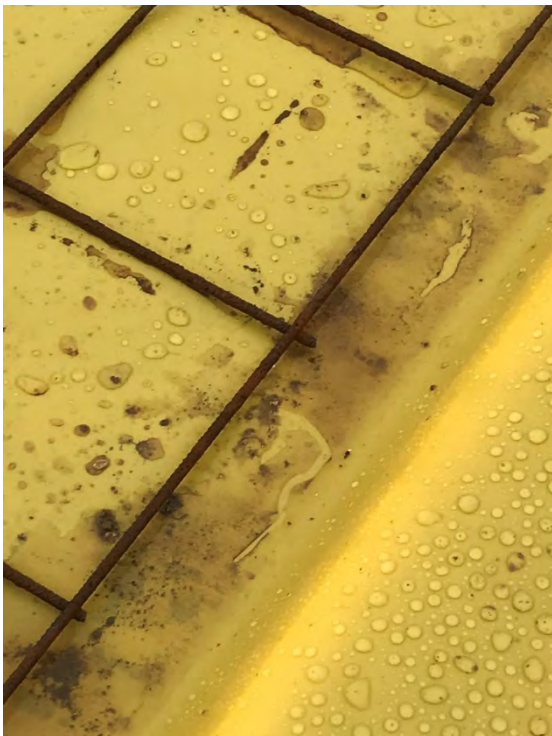
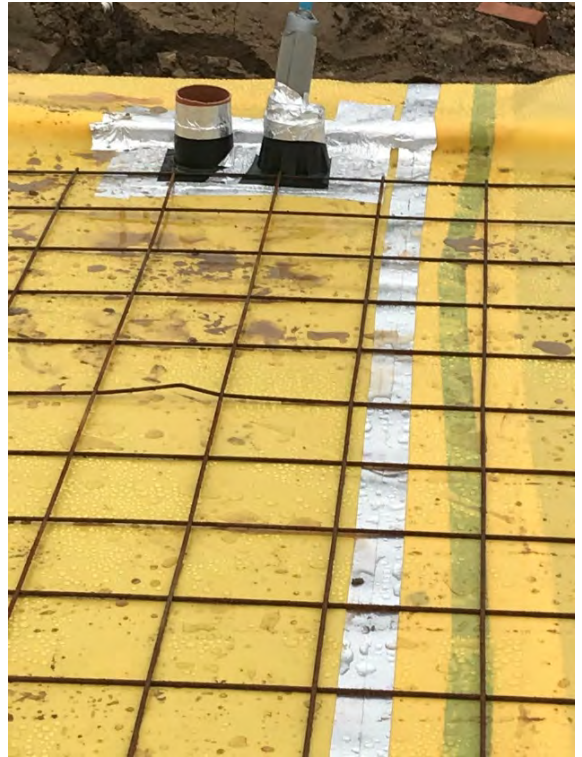
|                    |                                                                                                                                                    |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>CONCLUSION:</b> | Following the repair of all identified defects, the gas protection measures for Plot 930/931/932 are acceptable and comply with the specification. |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|

**Table 1** - Progress of Gas Protection Measures Inspections

| PLOTS           | STATUS                                                                                                                   |
|-----------------|--------------------------------------------------------------------------------------------------------------------------|
| 901/902/903     | Inspected and verified by BRD - 25/10/2019                                                                               |
| 904             | Inspected and verified by BRD - 09/10/2019                                                                               |
| 905/906/907     | Inspected and verified by BRD - 30/10/2019                                                                               |
| 908/909         | Groundworker contractor to provide statement and photographic evidence of successful fitting of gas protection measures. |
| 910/911         | Inspected and verified by BRD - 28/11/2019                                                                               |
| 912/913/914     | Inspected and verified by BRD - 03/12/2019                                                                               |
| 915             | Inspected and verified by BRD - 29/01/2020                                                                               |
| 916             | Inspected and verified by BRD - 29/01/2020                                                                               |
| 917/918/919     | Groundworker contractor to provide statement and photographic evidence of successful fitting of gas protection measures. |
| 920             | Partially inspected and verified by BRD - 03/12/2019                                                                     |
| 921/922         | Inspected and verified by BRD - 12/02/2020                                                                               |
| 923 (Stairwell) | Inspected and verified by BRD - 11/03/2020                                                                               |
| 924/925         | Inspected and verified by BRD - 11/03/2020                                                                               |
| 926 (Stairwell) | Inspected and verified by BRD - 11/03/2020                                                                               |
| 927/928/929     | Inspected and verified by BRD - 24/03/2020                                                                               |
| 930/931/932     | Inspected and verified by BRD - 10/08/2020                                                                               |
| 933/934         | Groundworker contractor to provide statement and photographic evidence of successful fitting of gas protection measures. |

## **APPENDIX 3**

# Contractor's Membrane Installation Photographs



Project Title: Public Open Space, Wygate Park, Spalding  
Client: Kier Living  
BRD Reference: BRD241183-OP13-A  
Date Issued: November 2020

## Contractor's Membrane Installation Photographs



Project Title: Public Open Space, Wygate Park, Spalding  
Client: Kier Living  
BRD Reference: BRD241183-OP13-A  
Date Issued: November 2020

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**From:** Karen Rushby <[info@cergroundworks.co.uk](mailto:info@cergroundworks.co.uk)>  
**Sent:** 21 October 2020 07:18  
**To:** Etheridge, Vicki <[Vicki.Etheridge@kier.co.uk](mailto:Vicki.Etheridge@kier.co.uk)>  
**Subject:** Re: BRD Letter of reliance HSBC/Kier - Wygate POS  
**Importance:** High

[This email was sent from an external sender outside of the Kier Group, please treat this email, links and attachments with caution.]

Vicky

Please see attached photos for plots 933/934. Plot 917/918/919 were taken by Darren Harrison as it was agreed that he would take the photos as BRD were unable to attend. Carl has contacted him and they were on his work phone which has been handed in.

We confirm that the plots 908/909/917/918/919 and 933/934 that were not subject to inspection by BRD for the gas protection measures were installed in accordance with the design and manufacturers instructions. They were installed CER Groundworks staff who have installed all the previous gas protections.

Kind Regards

Karen Rushby

Director

C E R Groundworks Limited  
01775724149/07773761679

The information contained in this e-mail is intended only for the named person or organisation to which it is addressed. If you have received it in error please disregard and advise me immediately.

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