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Document Verification

Project Title	"*Coed Issa*" Parc Brymbo, Wrexham
Project Number	7565
Document Title	Gas Membrane Validation Report for Plots 6-8
Document Number	7565gval_Plots 6-8
This document is not to be used for contractual or engineering purposes unless the document verification sheet is signed where indicated by the approver of the document.	

Prepared by



S L Dodd
BSc (Hons), MSc, AMIEnvSc, FGS

Checked and Approved



M A Wall
BSc (Hons), FGS

Document Revision

Report Reference	Date	Description	Prepared	Checked and Approved
7565gval_Plots 6-8	06/07/2022	Gas Membrane Validation Report for Plots 6-8	S L Dodd	M A Wall

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This report has been prepared for and on behalf of our client, in accordance with the terms and conditions of the appointment agreement with Coopers. Other than where specifically allowed for in the said appointment agreement, any other party using this report for any purpose whatsoever does so at their own risk and any duty of care to that party is specifically excluded.

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GAS MEMBRANE VALIDATION REPORT FOR PLOTS 6-8

Developer	Taylor Wimpey North-West
Site Name	"*Coed Issa*" Parc Brymbo, Wrexham
NHBC Site Reference	ENGPROJ/274367
Date of Report:	14/06/2022

Gas Mitigation Requirements

The assessments of the ground gas risk were initially drawn up for this site by Smith Grant (SG) LLP in 2007, with the completion report SG produced reviewed and enclosed within a report by Wardell Armstrong, dated November 2018. The previous assessments by SG identified that prior to remediation this parcel of the site was unaffected by hazardous ground gases. However, due to the absence of post remediation gas monitoring and the potential risks of gas emissions from previous coal mining beneath the site, all properties should be constructed with Characteristic Situation 2 (CS2) mitigation measures, as highlighted within Coopers report reference 7565bprs. The CS2 mitigation measures (following BS8485:2015+A1:2019) will therefore be installed on all of the proposed integral floor slabs to semi-stiff raft constructions.

The gas mitigation designs were shown on Coopers Drawing No. 7565/LRH/GS2A/RF/02. The gas mitigation measures were proposed to include a proprietary aluminium foil LDPE gas membrane, compliant with BS8485:2015+A1:2019. Underlying the gas membrane is the designated raft foundation. The insulation was proposed to overlay the gas membrane separating the membrane from the concrete screed to act as protection boards and limit risks of concrete corrosive attack to the membrane. The approved gas membrane types and associated tapes are listed in Table 1 (below).

For all the plots designated as CS2, the following proprietary gas membrane will have been heat sealed and used with associated products as appropriate.

Table 1: Approved Gas Membrane and Ancillary Products.

PRODUCT	MANAFACTURER	PRODUCT NAME
Gas Membrane	Visqueen	Gas Barrier
Detailing Strip	Visqueen	Detailing Strip (or Pro Detailing Strip)

Gas Mitigation Design Details

Coopers provided typical gas mitigation details for the proposed gas mitigation measures:

- Typical Gas Precaution Detail to Semi-Stiff Raft Foundation for Characteristic Situation 2 - *Drawing 7565/LRH/GS2A/RFSS/02.*

Additionally, Coopers have provided construction details for complex aspects of membrane installation:

- Gas Membrane Corner Detail - *2019-SD-GM-CU*
- Dual Service Entry Detail – *2019-SD-GM-DSE*
- Door Threshold Detail – *2019-SD-GM-DT_RevA*
- Service Entry Detail - *2019-SD-GM-SE*
- Party Wall Detail – *2019-PW-GM-SS*

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Plot Specific Verification Requirements

All plots are to be inspected and verified by Coopers, in accordance with CIRIA C735. The inspection criteria for each plot are as follows:

Inspection Criteria	Detailed Inspection Notes
1. Product Verification	*Confirmation that suitable products have been installed to consist of photographs of product types (manufacturer/name), labels on packaging and delivery tickets. Gas Membrane **AND** tapes*
2. General Condition	*The membrane is to be inspected to ensure there are no tears, punctures or rips. Take photographs of full plot status for each plot being inspected.*
3. Membrane Subgrade	*Commonly either insulation or sand blinding, check no gravel or other items with the potential to puncture when weight is applied.*
4. Jointing/Welds	*Checking the overlaps between membranes are correctly sealed, with correct tapes with sufficient overlaps or a good quality heat sealed weld if this method being utilised. Take photographs of at least one jointing section per plot being inspected to show sufficient overlap and use of tapes.*
5. Creases/folds	*Care must be taken to ensure that creases & folds within the membrane do not span over the jointing sections (bridging) as this provides an unacceptable gas pathway.*
6. Service Entry Points	*Verification of the presence of preformed tophats sealed to the pipe and membrane. If service entries are constructed using detailing strip or equivalent product then ensure adequate seal is achieved. Ensure installation is carried out in accordance with manufacturers guidance. Take photographs of all tophat installations.*
7. Corner Sections	*Not cut and folded where punctures are present but concealed with tapes. Either formed with Detailing Strip or preformed corner units.*
8. Reinforcement Spacers	*Use of metal spacers/ties with potential to puncture the membrane would only be permitted with protection board.*
9. Membrane Dirt/Debris	*Whilst we appreciate the membranes are constructed on a real-world construction site, the membrane must be free of debris such as stones or mortar that would be liable to damage the membrane when weight is applied through subsequent construction. Whilst mud is inevitable on the membrane it must be kept to a minimal level to allow the membrane to be inspected and defects disclosed. If the membrane is not visible due to the amount of mud then it will be failed and need to be cleaned for reinspection.*
10. Puncture Repairs	*Punctures are relatively common and occasional damage with proper repair is not considered to be indicative of defective workmanship. All punctures require a patch that spans the damaged section by at least 150mm on each side.*
11. Party Walls	*The use of temporary blockwork for shuttering commonly involves placing the gas membrane above the blocks for the initial concrete pour. When this is removed we advocate placing the membrane back to run flat through the party wall to allow this to be sealed and inspected on the subsequent plot. Alternative approaches are available but the membrane must not be cut and patched after the second plot is cast (due to additional damage, difficult repairs, and lack of inspection at this stage). Also if robust details adopted the membrane will need to drop through the cavity.*
12. Door Thresholds	*Care is required in relation to gas membrane positions through the wall cavity to the external wall around the door thresholds, closing the cavity, and protection beneath any sills. The use of preformed cloaking units and/or detailing strip protection would be recommended.*
13. Wall Cavity Inspection	*Confirming that proprietary gas membrane or gas DPC spans the external walls. Check for rips across cavity. Check for jointing detail of gas resistant DPC or membrane across cavity to main membrane. Take photographs for all plots inspected.*
14. Internal Garage	*One of the most common problems/defects in construction occur for internal garages where the membrane positions need to account for variations in proposed slab level. If internal garage then **phone office** during the visit to confirm the following items:*
a) Sloping Floor	*Check if the developer has sloping garages, if so these are critical to membrane positioning and requires particular attention to membrane positions.*
b) Internal Walls	*If sloping floor then check the membrane transitions at a low level through the internal wall to the plot to ensure it will not be exposed above the frontage of the sloping garage.*
c) External Walls	*If sloping floor then check the membrane steps up within the external wall cavity of the internal garage to ensure it is not exposed above the fall of the garage.*
d) Pillars	*Check the pillar/garage entrance section for the use of detailed strip to ensure not exposed around the entrance and closure of the cavity – refer to construction guide for details.*
15. External Wall Venting	*Check positioning of vents are on 3 sides of dwelling at approximately 2m centres. Take photographs of vents on external walls for each plot. (May be possible to photograph other plots on site which are at stage of installing vents. Will be useful for these plots later on).*
16. Subfloor Venting Type Checked	*If stone venting then check the stone is single sized, 20-40mm. May need to do this on adjacent plots, stockpile or ask for delivery tickets. Some designs need drains laid in the stone so check the construction details, if dims given then measure with tape and photograph*
17. Subfloor Venting Thickness	*The venting medium (void/stone) is of a designated thickness as shown on the gas design details. Photograph thickness of adjacent plots showing how large the void dimension will be with a staff. If not visible on adjacent plots request this item be provided for future inspection.*
18. Internal/Partition Wall Venting	*Check the spacing and dimensions of any interconnecting pipes between the subfloor venting medium. This can vary by size of building and design approaches so be careful to check against the gas details*

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Plot Specific Gas Inspection

Coopers' inspection of the installed gas mitigation measures took place on the dates shown on the attached Coopers "Gas Mitigation Inspection Record Sheets". Taylor Wimpey North-West and their contractor MJ Evans Ltd subcontracted the gas membrane installation to UK Membranes Ltd for heat welded installation. Whilst specialists in gas membrane installation they provided no information to indicate they were NVQ2 qualified and therefore designated the same as a general contractor under CIRIA C735. The contractors opted to use Visqueen Gas Barrier membrane which comprises a multi-layer, reinforced polyethylene gas barrier with a central shield layer of 20-micron thick aluminium foil protected by a separate coating.

The inspections occurred prior to the placement of the insulation; this was in order to inspect the membranes prior to their obscuration during the construction of the plots. Coopers noted that the membranes were adequately sealed to service entrance points and were present over the entire internal floor space of the plots. The inspections identified that the membranes were installed to a good standard. The attached Coopers "Gas Mitigation Inspection Record Sheets" detail the protective measures that were witnessed on these plots. All measures were determined to have been installed in accordance with Coopers approved design.

PHOTOGRAPHIC RECORDS OF TYPICAL INSTALLATION



Photograph 1: Showing the general condition of the gas membrane installation on Plots 6-7 as witnessed by Coopers on 26th May 2022.



Photograph 2: Showing the gas membrane spanning the external walls on Plots 6-7, as witnessed by Coopers on 26th May 2022.



Photograph 3: Showing the heat sealed jointing of the membrane on Plots 6-7, as witnessed by Coopers on 26th May 2022.



Photograph 4: Showing the gas membrane sealed to a dual service entry point as per Coopers detail on Plots 6-7, as witnessed by Coopers on 26th May 2022.

DEVELOPMENT NAME:	"Coed Issa" Parc Brymbo, Wrexham	Validation Certificate Approved By	MAW



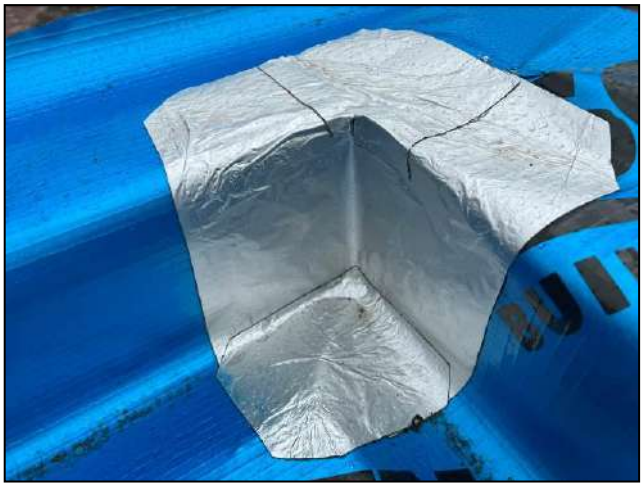
Photograph 5: Showing the gas membrane formed around a complex corner section as per Coopers detail on Plots 6-7, as witnessed by Coopers on 26th May 2022.



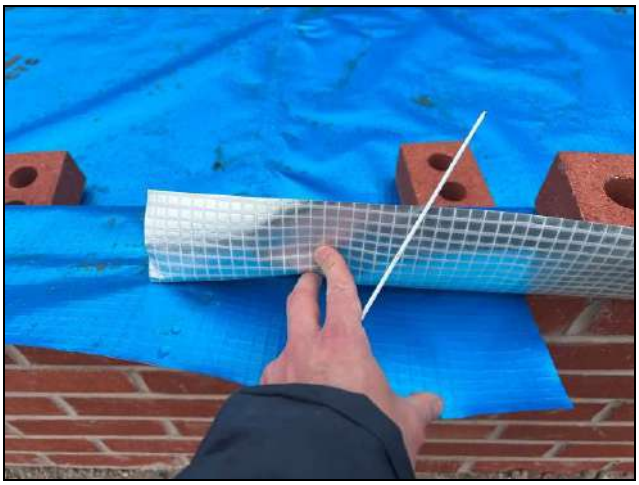
Photograph 6: Showing the general condition of the gas membrane installation on Plot 8 as witnessed by Coopers on 26th May 2022.



Photograph 7: Showing the gas membrane spanning the external walls on Plot 8, as witnessed by Coopers on 26th May 2022.



Photograph 8: Showing the gas membrane formed around a complex corner section as per Coopers detail on Plot 8, as witnessed by Coopers on 26th May 2022.



Photograph 9: Showing the heat sealed jointing of the membrane on Plot 8, as witnessed by Coopers on 26th May 2022.



Photograph 10: Showing the gas membrane sealed to a dual service entry point as per Coopers detail on Plot 8, as witnessed by Coopers on 26th May 2022.

Coopers confirm the gas mitigation measures were installed in accordance with the approved construction details for these plots. More photographs are available upon request.

Documents appended:

1. Coopers Gas Mitigation Inspection Record Sheet Plots 6-7, dated 26th May 2022.
2. Coopers Gas Mitigation Inspection Record Sheet Plot 8, dated 26th May 2022.

Footnote: -

It is advisable that this document is forwarded to the local authority environmental health department and the relevant warranty provider's engineering department for their approval. This Report is a record of Coopers' inspection on the dates given within the aforementioned text. Coopers undertake inspections when requested by the developer. Compliance or non-compliance of the criteria is ascertained on those dates only. Coopers cannot be held responsible for any subsequent actions by third parties not under Coopers direct supervision, which may compromise the integrity of the gas precaution measures after the date of validation.

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GAS MITIGATION INSPECTION RECORD SHEET

PROJECT NAME:	: Parc Brynjo, Heritage Way, Brynjo		
DATE OF INSPECTION:	: 26/5/22	**PROJECT No.:**	7565
INSPECTED BY:	: AW	**PLOT No. INSPECTED:**	6-7

	INSPECTED ITEM	✓/X/n/a	REMARKS
	GAS MEMBRANE		
1	Product Identification *(membrane & tapes)*	✓	Visqueen Gas Barrier and pro-detailing strip
2	General Condition	✓	Good - few repairs needed
3	Membrane Subgrade	✓	Concrete raft
4	Jointing/Welds	✓	Joints welded at >100 mm overlaps
5	Creases/Folds	✓	None noted
6	Service Entry Points	✓	Sealed using pro-detailing strip
7	Corner Sections	✓	Sealed using pro-detailing strip
8	Reinforcement Spacers	N/A	
9	Membrane Dirt/Debris	✓	Largely clean, minor amount of dirt
10	Puncture Repairs	✓	5 No. initial puncture repairs noted on arrival. 10 No. further repairs required following removal of loose chips beneath. All using detailing strip
11	Party Walls	✓	Membrane spanned across party wall level.
12	Door Thresholds	✓	Membrane brought up inside cavity. Spanned door threshold
13	Cavity Inspection	✓	Membrane spanned cavity
14	Internal Garage		
a)	Sloping Floor	N/A	
b)	Internal Walls		
c)	External Walls		
d)	Pillars		
	PASSIVE VENTING		
15	External Wall Venting	N/A	
16	Subfloor Venting Type Checked	N/A	
17	Subfloor Venting Thickness	N/A	
18	Internal/Partition Wall Venting	N/A	

***Final Remarks/Additional Notes:**

Advised to improve sweep of slab to remove chips prior to laying membrane.

INSPECTION APPROVAL	COMPLETE ONE BOX:
The inspection has PASSED in accordance to all items of the inspection	✓
The inspection has PASSED. Attention is drawn to item Numbers:	
The inspection has FAILED due to issues with items Numbers: (an additional visit is required)	

SIGNED:

Site Manager: (Print Name [redacted] ..

Verification Engineer: (Pr [redacted] ..

Please note that this inspection record sheet is not valid if not read in conjunction with Coopers corresponding Validation Report.

Park House, Sandpiper Court, Chester Business Park, Chester, CH4 9QU

COOPERS is the trading name of Coopers (Chester) Limited. Company registered in England & Wales. Company number 09730429.

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web: www.coopers.co.uk
email: admin@coopers.co.uk

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GAS MITIGATION INSPECTION RECORD SHEET

PROJECT NAME:	: Park Brynteg		
DATE OF INSPECTION:	: 26/5/22	**PROJECT No.:**	7565
INSPECTED BY:	: AW	**PLOT No. INSPECTED:**	8

	INSPECTED ITEM	✓/X/n/a	REMARKS
	GAS MEMBRANE		
1	Product Identification *(membrane & tapes)*	✓	Visqueen Gas Barrier and Pro-detailing strip
2	General Condition	✓	Good
3	Membrane Subgrade	✓	Concrete raft
4	Jointing/Welds	✓	Joints welded with overlaps > 100mm
5	Creases/Folds	✓	None noted
6	Service Entry Points	✓	Sealed using detailing strip
7	Corner Sections	✓	Sealed using detailing strip
8	Reinforcement Spacers	N/A	
9	Membrane Dirt/Debris	✓	Clean
10	Puncture Repairs	✓	5 No. repairs noted on arrival using detailing strip. Mainly to reinforce welded joints. No. Further repairs needed
11	Party Walls	N/A	
12	Door Thresholds	✓	Membrane brought up inside cavity, spanning door threshold
13	Cavity Inspection	✓	Spanned cavity
14	Internal Garage	Yes	
a)	Sloping Floor	✓	irrelevant as membrane brought up inside cavity
b)	Internal Walls	✓	Spanned internal wall
c)	External Walls	✓	spanned ext + cavity wall
d)	Pillars	✓	Sealed either side with detailing strip
	PASSIVE VENTING		
15	External Wall Venting	N/A	
16	Subfloor Venting Type Checked	N/A	
17	Subfloor Venting Thickness	N/A	
18	Internal/Partition Wall Venting	N/A	

***Final Remarks/Additional Notes:**

INSPECTION APPROVAL	COMPLETE ONE BOX:
The inspection has PASSED in accordance to all items of the inspection	
The inspection has PASSED. Attention is drawn to item Numbers:	
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SIGNED:
Site Manager: (Print Name) . [redacted]

Verification Engineer: (Print

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Park House, Sandpiper Court,
Chester Business Park,
Chester, CH4 9QU

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email: admin@coopers.co.uk

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Document Verification

Project Title	"*Coed Issa*" Parc Brymbo, Wrexham
Project Number	7565
Document Title	Gas Membrane Validation Report for Plots 9-10 & 31
Document Number	7565gval_Plots 9-10 & 31
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Prepared by

[redacted]

L Phillips
MEng (Hons)

Checked and Approved

[redacted]

M A Wall
BSc (Hons), FGS

Document Revision

Report Reference	Date	Description	Prepared	Checked and Approved
7565gval Plots 9-10 & 31	02/08/2022	Gas Membrane Validation Report for Plots 9-10 & 31	L Phillips	M A Wall

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GAS MEMBRANE VALIDATION REPORT FOR PLOTS 9-10 & 31

Developer	Taylor Wimpey North-West
Site Name	"*Coed Issa*" Parc Brymbo, Wrexham
NHBC Site Reference	ENGPROJ/274367
Date of Report:	2nd August 2022

Gas Mitigation Requirements

The assessments of the ground gas risk were initially drawn up for this site by Smith Grant (SG) LLP in 2007, with the completion report SG produced reviewed and enclosed within a report by Wardell Armstrong, dated November 2018. The previous assessments by SG identified that prior to remediation this parcel of the site was unaffected by hazardous ground gases. However, due to the absence of post remediation gas monitoring and the potential risks of gas emissions from previous coal mining beneath the site, all properties should be constructed with Characteristic Situation 2 (CS2) mitigation measures, as highlighted within Coopers report reference 7565bprs. The CS2 mitigation measures (following BS8485:2015+A1:2019) will therefore be installed on all of the proposed integral floor slabs to semi-stiff raft constructions.

The gas mitigation designs were shown on Coopers Drawing No. 7565/LRH/GS2A/RF/02. The gas mitigation measures were proposed to include a proprietary aluminium foil LDPE gas membrane, compliant with BS8485:2015+A1:2019. Underlying the gas membrane is the designated raft foundation. The insulation was proposed to overlay the gas membrane separating the membrane from the concrete screed to act as protection boards and limit risks of concrete corrosive attack to the membrane. The approved gas membrane types and associated tapes are listed in Table 1 (below).

For all the plots designated as CS2, the following proprietary gas membrane will have been heat sealed and used with associated products as appropriate.

Table 1: Approved Gas Membrane and Ancillary Products.

PRODUCT	MANAFACTURER	PRODUCT NAME
Gas Membrane	Visqueen	Gas Barrier
Detailing Strip	Visqueen	Detailing Strip (or Pro Detailing Strip)

Gas Mitigation Design Details

Coopers provided typical gas mitigation details for the proposed gas mitigation measures:

- Typical Gas Precaution Detail to Semi-Stiff Raft Foundation for Characteristic Situation 2 - *Drawing 7565/LRH/GS2A/RFSS/02.*

Additionally, Coopers have provided construction details for complex aspects of membrane installation:

- Gas Membrane Corner Detail - *2019-SD-GM-CU*
- Dual Service Entry Detail – *2019-SD-GM-DSE*
- Door Threshold Detail – *2019-SD-GM-DT_RevA*
- Service Entry Detail - *2019-SD-GM-SE*
- Party Wall Detail – *2019-PW-GM-SS*

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Plot Specific Verification Requirements

All plots are to be inspected and verified by Coopers, in accordance with CIRIA C735. The inspection criteria for each plot are as follows:

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3. Membrane Subgrade	*Commonly either insulation or sand blinding, check no gravel or other items with the potential to puncture when weight is applied.*
4. Jointing/Welds	*Checking the overlaps between membranes are correctly sealed, with correct tapes with sufficient overlaps or a good quality heat sealed weld if this method being utilised. Take photographs of at least one jointing section per plot being inspected to show sufficient overlap and use of tapes.*
5. Creases/folds	*Care must be taken to ensure that creases & folds within the membrane do not span over the jointing sections (bridging) as this provides an unacceptable gas pathway.*
6. Service Entry Points	*Verification of the presence of preformed tophats sealed to the pipe and membrane. If service entries are constructed using detailing strip or equivalent product then ensure adequate seal is achieved. Ensure installation is carried out in accordance with manufacturers guidance. Take photographs of all tophat installations.*
7. Corner Sections	*Not cut and folded where punctures are present but concealed with tapes. Either formed with Detailing Strip or preformed corner units.*
8. Reinforcement Spacers	*Use of metal spacers/ties with potential to puncture the membrane would only be permitted with protection board.*
9. Membrane Dirt/Debris	*Whilst we appreciate the membranes are constructed on a real-world construction site, the membrane must be free of debris such as stones or mortar that would be liable to damage the membrane when weight is applied through subsequent construction. Whilst mud is inevitable on the membrane it must be kept to a minimal level to allow the membrane to be inspected and defects disclosed. If the membrane is not visible due to the amount of mud then it will be failed and need to be cleaned for reinspection.*
10. Puncture Repairs	*Punctures are relatively common and occasional damage with proper repair is not considered to be indicative of defective workmanship. All punctures require a patch that spans the damaged section by at least 150mm on each side.*
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12. Door Thresholds	*Care is required in relation to gas membrane positions through the wall cavity to the external wall around the door thresholds, closing the cavity, and protection beneath any sills. The use of preformed cloaking units and/or detailing strip protection would be recommended.*
13. Wall Cavity Inspection	*Confirming that proprietary gas membrane or gas DPC spans the external walls. Check for rips across cavity. Check for jointing detail of gas resistant DPC or membrane across cavity to main membrane. Take photographs for all plots inspected.*
14. Internal Garage	*One of the most common problems/defects in construction occur for internal garages where the membrane positions need to account for variations in proposed slab level. If internal garage then **phone office** during the visit to confirm the following items:*
a) Sloping Floor	*Check if the developer has sloping garages, if so these are critical to membrane positioning and requires particular attention to membrane positions.*
b) Internal Walls	*If sloping floor then check the membrane transitions at a low level through the internal wall to the plot to ensure it will not be exposed above the frontage of the sloping garage.*
c) External Walls	*If sloping floor then check the membrane steps up within the external wall cavity of the internal garage to ensure it is not exposed above the fall of the garage.*
d) Pillars	*Check the pillar/garage entrance section for the use of detailed strip to ensure not exposed around the entrance and closure of the cavity – refer to construction guide for details.*
15. External Wall Venting	*Check positioning of vents are on 3 sides of dwelling at approximately 2m centres. Take photographs of vents on external walls for each plot. (May be possible to photograph other plots on site which are at stage of installing vents. Will be useful for these plots later on).*
16. Subfloor Venting Type Checked	*If stone venting then check the stone is single sized, 20-40mm. May need to do this on adjacent plots, stockpile or ask for delivery tickets. Some designs need drains laid in the stone so check the construction details, if dims given then measure with tape and photograph*
17. Subfloor Venting Thickness	*The venting medium (void/stone) is of a designated thickness as shown on the gas design details. Photograph thickness of adjacent plots showing how large the void dimension will be with a staff. If not visible on adjacent plots request this item be provided for future inspection.*
18. Internal/Partition Wall Venting	*Check the spacing and dimensions of any interconnecting pipes between the subfloor venting medium. This can vary by size of building and design approaches so be careful to check against the gas details*

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Plot Specific Gas Inspection

Coopers' inspection of the installed gas mitigation measures took place on the dates shown on the attached Coopers "Gas Mitigation Inspection Record Sheets". Taylor Wimpey North-West and their contractor MJ Evans Ltd subcontracted the gas membrane installation to UK Membranes Ltd for heat welded installation. Whilst specialists in gas membrane installation they provided no information to indicate they were NVQ2 qualified and therefore designated the same as a general contractor under CIRIA C735. The contractors opted to use Visqueen Gas Barrier membrane which comprises a multi-layer, reinforced polyethylene gas barrier with a central shield layer of 20-micron thick aluminium foil protected by a separate coating.

The inspections occurred prior to the placement of the insulation; this was in order to inspect the membranes prior to their obscuration during the construction of the plots. Coopers noted that the membranes were adequately sealed to service entrance points and were present over the entire internal floor space of the plots. The inspections identified that the membranes were installed to a good standard. The attached Coopers "Gas Mitigation Inspection Record Sheets" detail the protective measures that were witnessed on these plots. All measures were determined to have been installed in accordance with Coopers approved design.

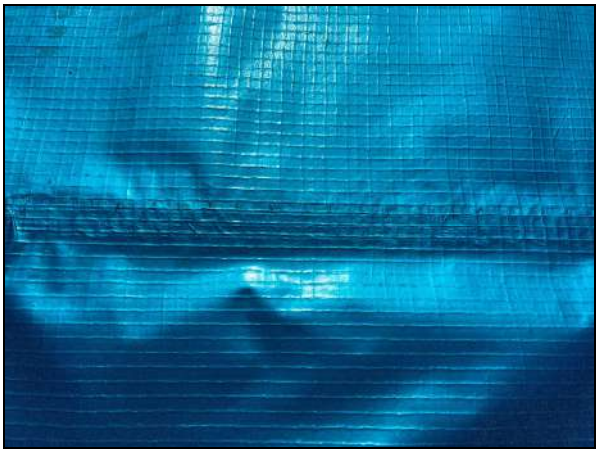
PHOTOGRAPHIC RECORDS OF TYPICAL INSTALLATION



Photograph 1: Showing the general condition of the gas membrane installation on Plots 9-10 as witnessed by Coopers on 7th July 2022.



Photograph 2: Showing the gas membrane spanning the external walls on Plots 9-10, as witnessed by Coopers on 7th July 2022.



Photograph 3: Showing the heat sealed jointing of the gas membrane on Plots 9-10, as witnessed by Coopers on 7th July 2022.



Photograph 4: Showing the gas membrane sealed to a service entry point as per Coopers detail on Plots 9-10, as witnessed by Coopers on 7th July 2022.

DEVELOPMENT NAME:	"Coed Issa" Parc Brymbo, Wrexham	Validation Certificate Approved By	MAW



Photograph 5: Showing the gas membrane sealed to a dual service entry point as per Coopers detail on Plots 9-10, as witnessed by Coopers on 7th July 2022.



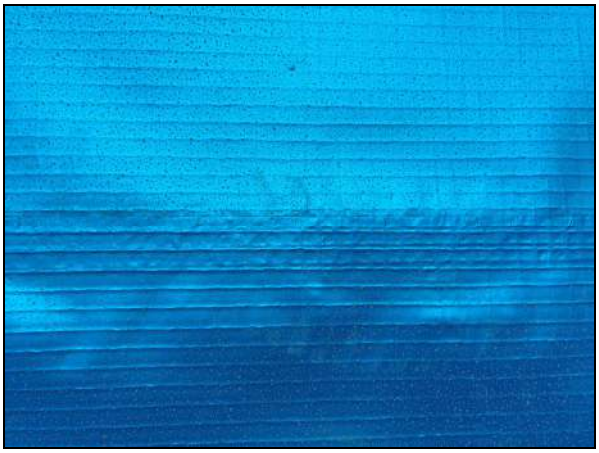
Photograph 6: Showing the gas membrane formed around a complex corner section as per Coopers detail on Plots 9-10, as witnessed by Coopers on 7th July 2022.



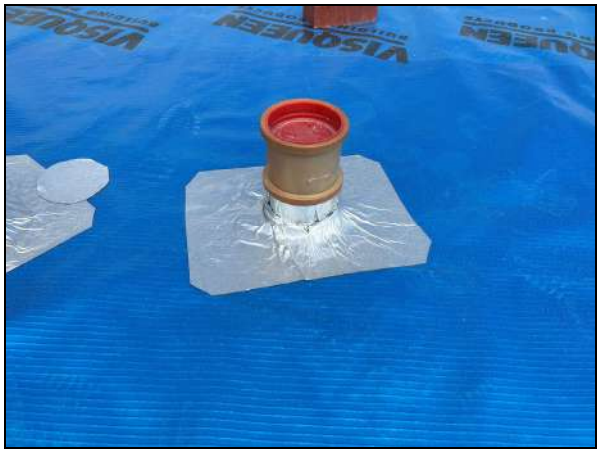
Photograph 7: Showing the general condition of the gas membrane installation on Plot 31, as witnessed by Coopers on 7th July 2022.



Photograph 8: Showing the gas membrane spanning the external walls on Plot 31, as witnessed by Coopers on 7th July 2022.



Photograph 9: Showing the heat sealed jointing of the gas membrane on Plot 31, as witnessed by Coopers on 7th July 2022.



Photograph 10: Showing the gas membrane sealed to a service entry point as per Coopers detail on Plot 31, as witnessed by Coopers on 7th July 2022.



Photograph 11: Showing the gas membrane formed around an internal garage pillar on Plot 31, as witnessed by Coopers on 7th July 2022.



Photograph 12: Showing the gas membrane formed around a complex corner section as per Coopers detail on Plot 31, as witnessed by Coopers on 7th July 2022.

Coopers confirm the gas mitigation measures were installed in accordance with the approved construction details for these plots. More photographs are available upon request.

Documents appended:

1. Coopers Gas Mitigation Inspection Record Sheet Plots 9-10, dated 7th July 2022.
2. Coopers Gas Mitigation Inspection Record Sheet Plots 31, dated 7th July 2022.

Footnote: -

It is advisable that this document is forwarded to the local authority environmental health department and the relevant warranty provider's engineering department for their approval. This Report is a record of Coopers' inspection on the dates given within the aforementioned text. Coopers undertake inspections when requested by the developer. Compliance or non-compliance of the criteria is ascertained on those dates only. Coopers cannot be held responsible for any subsequent actions by third parties not under Coopers direct supervision, which may compromise the integrity of the gas precaution measures after the date of validation.

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GAS MITIGATION INSPECTION RECORD SHEET

PROJECT NAME:	: HERITAGE WAY, BRYMBO		
DATE OF INSPECTION:	: 07/07/2022.	**PROJECT No.:**	7565
INSPECTED BY:	: LP.	**PLOT No. INSPECTED:**	9-10

	INSPECTED ITEM	✓/X/n/a	REMARKS
	GAS MEMBRANE		
1	Product Identification *(membrane & tapes)*	✓	VISQUEEN GAS MEMBRANE + ASSOCIATED PRODUCTS.
2	General Condition	✓	GOOD OVERALL CONDITION
3	Membrane Subgrade	✓	RAFT.
4	Jointing/Welds	✓	HEAT WELDED JOINTS
5	Creases/Folds	✓	NO CREASES/FOLDS OVER JOINTS
6	Service Entry Points	✓	8 NO. S.E.P CONSTRUCTED USING VISQUEEN PRO DETAIL STRIP
7	Corner Sections	✓	CONSTRUCTED USING PRO DETAIL STRIP
8	Reinforcement Spacers	N/A	
9	Membrane Dirt/Debris	✓	CLEAN LITTLE DIRT/DEBRIS
10	Puncture Repairs	✓	NO PUNCTURE REPAIRS REQ.
11	Party Walls	N/A	
12	Door Thresholds	✓	MEMBRANE STEPS UP INTO CAVITY
13	Cavity Inspection	✓	MEMBRANE SPANS EX WALLS ON ALL SIDES.
14	Internal Garage	N/A	
a)	Sloping Floor		
b)	Internal Walls		
c)	External Walls		
d)	Pillars		
	PASSIVE VENTING		
15	External Wall Venting	N/A	
16	Subfloor Venting Type Checked	N/A	
17	Subfloor Venting Thickness	N/A	
18	Internal/Partition Wall Venting	N/A	

***Final Remarks/Additional Notes:**

INSPECTION APPROVAL	COMPLETE ONE BOX:
The inspection has PASSED in accordance to all items of the inspection	✓
The inspection has PASSED, Attention is drawn to item Numbers:	
The inspection has FAILED due to issues with items Numbers: (an additional visit is required)	

SIGNED:
Site Manager: (Print Name) [redacted]

Verification Engineer: (Print [redacted]

Park House, Sandpiper Court,
Chester Business Park,
Chester, CH4 9QU

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GAS MITIGATION INSPECTION RECORD SHEET

PROJECT NAME:	: HEWITAGE WAY, BRYMBO		
DATE OF INSPECTION:	: 07/07/2022	**PROJECT No.:**	7565
INSPECTED BY:	: LP	**PLOT No. INSPECTED:**	31

	INSPECTED ITEM	✓/X/n/a	REMARKS
	GAS MEMBRANE		
1	Product Identification *(membrane & tapes)*	✓	VISQUEEN GAS MEMBRANE + ASSOCIATED PRODUCTS
2	General Condition	✓	GOOD – NO VISIBLE DAMAGE
3	Membrane Subgrade	✓	
4	Jointing/Welds	✓	HEAT WELDED JOINTS.
5	Creases/Folds	✓	NO CREASES FOLDS/OVER JOINTS
6	Service Entry Points	✓	NO S.E.P CONSTRUCTED USING PRO DETAIL STRIP.
7	Corner Sections	✓	CONSTRUCTED USING PRO DETAIL STRIP
8	Reinforcement Spacers	N/A	
9	Membrane Dirt/Debris	✓	CLEAN V. LITTLE DIRT/DEBRIS
10	Puncture Repairs	N/A	NO REPAIRS REQ.
11	Party Walls	N/A	
12	Door Thresholds	✓	MEMBRANE STEPS UP INTO CAVITY
13	Cavity Inspection	✓	MEMBRANE SPANS CAVITY ON ALL EX. SIDES
14	Internal Garage		
a)	Sloping Floor	N/A	
b)	Internal Walls		
c)	External Walls		
d)	Pillars		
	PASSIVE VENTING		
15	External Wall Venting	N/A	
16	Subfloor Venting Type Checked	N/A	
17	Subfloor Venting Thickness	N/A	
18	Internal/Partition Wall Venting	N/A	

***Final Remarks/Additional Notes:**

INSPECTION APPROVAL	COMPLETE ONE BOX:
The inspection has PASSED in accordance to all items of the inspection	✓
The inspection has PASSED, Attention is drawn to item Numbers:	
The inspection has FAILED due to issues with items Numbers: (an additional visit is required)	

SIGNED:

Site Manager: (Print Name) [redacted]

Verification Engineer: (Pri[redacted]

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Document Verification

Project Title	"*Coed Issa*" Parc Brymbo, Wrexham
Project Number	7565
Document Title	Gas Membrane Validation Report for Plots 11-12 & 30
Document Number	7565gval_plots 11-12 & 30
This document is not to be used for contractual or engineering purposes unless the document verification sheet is signed where indicated by the approver of the document.	

Prepared by



S Thomas
BSc (Hons), MSc

Checked and Approved



M A Wall
BSc (Hons), FGS

Document Revision

Report Reference	Date	Description	Prepared	Checked and Approved
7565gval plots 11-12 & 30	28/07/2022	Gas Membrane Validation Report for Plots 11-12 & 30	S Thomas	M A Wall

THE BRITISH VERIFICATION COUNCIL · GROUND GAS PROTECTION SYSTEMS · B V C

This report has been prepared for and on behalf of our client, in accordance with the terms and conditions of the appointment agreement with Coopers. Other than where specifically allowed for in the said appointment agreement, any other party using this report for any purpose whatsoever does so at their own risk and any duty of care to that party is specifically excluded.

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GAS MEMBRANE VALIDATION REPORT FOR PLOTS 11-12 & 30

Developer	Taylor Wimpey North-West
Site Name	"*Coed Issa*" Parc Brymbo, Wrexham
NHBC Site Reference	ENGPROJ/274367
Date of Report:	28/07/2022

Gas Mitigation Requirements

The assessments of the ground gas risk were initially drawn up for this site by Smith Grant (SG) LLP in 2007, with the completion report SG produced reviewed and enclosed within a report by Wardell Armstrong, dated November 2018. The previous assessments by SG identified that prior to remediation this parcel of the site was unaffected by hazardous ground gases. However, due to the absence of post remediation gas monitoring and the potential risks of gas emissions from previous coal mining beneath the site, all properties should be constructed with Characteristic Situation 2 (CS2) mitigation measures, as highlighted within Coopers report reference 7565bprs. The CS2 mitigation measures (following BS8485:2015+A1:2019) will therefore be installed on all of the proposed integral floor slabs to semi-stiff raft constructions.

The gas mitigation designs were shown on Coopers Drawing No. 7565/LRH/GS2A/RF/02. The gas mitigation measures were proposed to include a proprietary aluminium foil LDPE gas membrane, compliant with BS8485:2015+A1:2019. Underlying the gas membrane is the designated raft foundation. The insulation was proposed to overlay the gas membrane separating the membrane from the concrete screed to act as protection boards and limit risks of concrete corrosive attack to the membrane. The approved gas membrane types and associated tapes are listed in Table 1 (below).

For all the plots designated as CS2, the following proprietary gas membrane will have been heat sealed and used with associated products as appropriate.

Table 1: Approved Gas Membrane and Ancillary Products.

PRODUCT	MANAFACTURER	PRODUCT NAME
Gas Membrane	JUTA	GP1
Detailing Strip	JUTA	Self-Adhesive Membrane

Gas Mitigation Design Details

Coopers provided typical gas mitigation details for the proposed gas mitigation measures:

- Typical Gas Precaution Detail to Semi-Stiff Raft Foundation for Characteristic Situation 2 - *Drawing 7565/LRH/GS2A/RFSS/02.*

Additionally, Coopers have provided construction details for complex aspects of membrane installation:

- Gas Membrane Corner Detail - *2019-SD-GM-CU*
- Dual Service Entry Detail – *2019-SD-GM-DSE*
- Door Threshold Detail – *2019-SD-GM-DT_RevA*
- Service Entry Detail - *2019-SD-GM-SE*
- Party Wall Detail – *2019-PW-GM-SS*

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Plot Specific Verification Requirements

All plots are to be inspected and verified by Coopers, in accordance with CIRIA C735. The inspection criteria for each plot are as follows:

Inspection Criteria	Detailed Inspection Notes
1. Product Verification	*Confirmation that suitable products have been installed to consist of photographs of product types (manufacturer/name), labels on packaging and delivery tickets. Gas Membrane **AND** tapes*
2. General Condition	*The membrane is to be inspected to ensure there are no tears, punctures or rips. Take photographs of full plot status for each plot being inspected.*
3. Membrane Subgrade	*Commonly either insulation or sand blinding, check no gravel or other items with the potential to puncture when weight is applied.*
4. Jointing/Welds	*Checking the overlaps between membranes are correctly sealed, with correct tapes with sufficient overlaps or a good quality heat sealed weld if this method being utilised. Take photographs of at least one jointing section per plot being inspected to show sufficient overlap and use of tapes.*
5. Creases/folds	*Care must be taken to ensure that creases & folds within the membrane do not span over the jointing sections (bridging) as this provides an unacceptable gas pathway.*
6. Service Entry Points	*Verification of the presence of preformed tophats sealed to the pipe and membrane. If service entries are constructed using detailing strip or equivalent product then ensure adequate seal is achieved. Ensure installation is carried out in accordance with manufacturers guidance. Take photographs of all tophat installations.*
7. Corner Sections	*Not cut and folded where punctures are present but concealed with tapes. Either formed with Detailing Strip or preformed corner units.*
8. Reinforcement Spacers	*Use of metal spacers/ties with potential to puncture the membrane would only be permitted with protection board.*
9. Membrane Dirt/Debris	*Whilst we appreciate the membranes are constructed on a real-world construction site, the membrane must be free of debris such as stones or mortar that would be liable to damage the membrane when weight is applied through subsequent construction. Whilst mud is inevitable on the membrane it must be kept to a minimal level to allow the membrane to be inspected and defects disclosed. If the membrane is not visible due to the amount of mud then it will be failed and need to be cleaned for reinspection.*
10. Puncture Repairs	*Punctures are relatively common and occasional damage with proper repair is not considered to be indicative of defective workmanship. All punctures require a patch that spans the damaged section by at least 150mm on each side.*
11. Party Walls	*The use of temporary blockwork for shuttering commonly involves placing the gas membrane above the blocks for the initial concrete pour. When this is removed we advocate placing the membrane back to run flat through the party wall to allow this to be sealed and inspected on the subsequent plot. Alternative approaches are available but the membrane must not be cut and patched after the second plot is cast (due to additional damage, difficult repairs, and lack of inspection at this stage). Also if robust details adopted the membrane will need to drop through the cavity.*
12. Door Thresholds	*Care is required in relation to gas membrane positions through the wall cavity to the external wall around the door thresholds, closing the cavity, and protection beneath any sills. The use of preformed cloaking units and/or detailing strip protection would be recommended.*
13. Wall Cavity Inspection	*Confirming that proprietary gas membrane or gas DPC spans the external walls. Check for rips across cavity. Check for jointing detail of gas resistant DPC or membrane across cavity to main membrane. Take photographs for all plots inspected.*
14. Internal Garage	*One of the most common problems/defects in construction occur for internal garages where the membrane positions need to account for variations in proposed slab level. If internal garage then **phone office** during the visit to confirm the following items:*
a) Sloping Floor	*Check if the developer has sloping garages, if so these are critical to membrane positioning and requires particular attention to membrane positions.*
b) Internal Walls	*If sloping floor then check the membrane transitions at a low level through the internal wall to the plot to ensure it will not be exposed above the frontage of the sloping garage.*
c) External Walls	*If sloping floor then check the membrane steps up within the external wall cavity of the internal garage to ensure it is not exposed above the fall of the garage.*
d) Pillars	*Check the pillar/garage entrance section for the use of detailed strip to ensure not exposed around the entrance and closure of the cavity – refer to construction guide for details.*
15. External Wall Venting	*Check positioning of vents are on 3 sides of dwelling at approximately 2m centres. Take photographs of vents on external walls for each plot. (May be possible to photograph other plots on site which are at stage of installing vents. Will be useful for these plots later on).*
16. Subfloor Venting Type Checked	*If stone venting then check the stone is single sized, 20-40mm. May need to do this on adjacent plots, stockpile or ask for delivery tickets. Some designs need drains laid in the stone so check the construction details, if dims given then measure with tape and photograph*
17. Subfloor Venting Thickness	*The venting medium (void/stone) is of a designated thickness as shown on the gas design details. Photograph thickness of adjacent plots showing how large the void dimension will be with a staff. If not visible on adjacent plots request this item be provided for future inspection.*
18. Internal/Partition Wall Venting	*Check the spacing and dimensions of any interconnecting pipes between the subfloor venting medium. This can vary by size of building and design approaches so be careful to check against the gas details*

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Plot Specific Gas Inspection

Coopers' inspection of the installed gas mitigation measures took place on the dates shown on the attached Coopers "Gas Mitigation Inspection Record Sheets". Taylor Wimpey North-West and their contractor MJ Evans Ltd subcontracted the gas membrane installation to UK Membranes Ltd for heat welded installation. Whilst specialists in gas membrane installation they provided no information to indicate they were NVQ2 qualified and therefore designated the same as a general contractor under CIRIA C735. The contractors opted to use JUTA GP1 as the gas membrane which comprises a multi-layer, reinforced polyethylene gas barrier with a central shield layer of 20-micron thick aluminium foil protected by a separate coating.

The inspections occurred prior to the placement of the insulation; this was in order to inspect the membranes prior to their obscuration during the construction of the plots. Coopers noted that the membranes were adequately sealed to service entrance points and were present over the entire internal floor space of the plots. The inspections identified that the membranes were installed to a good standard. The attached Coopers "Gas Mitigation Inspection Record Sheets" detail the protective measures that were witnessed on these plots. All measures were determined to have been installed in accordance with Coopers approved design.

PHOTOGRAPHIC RECORDS OF TYPICAL INSTALLATION



Photograph 1: Showing the general condition of the gas membrane installation on Plots 11-12 as witnessed by Coopers on 19th July 2022.



Photograph 2: Showing the gas membrane spanning the external walls on Plots 11-12 as witnessed by Coopers on 19th July 2022.

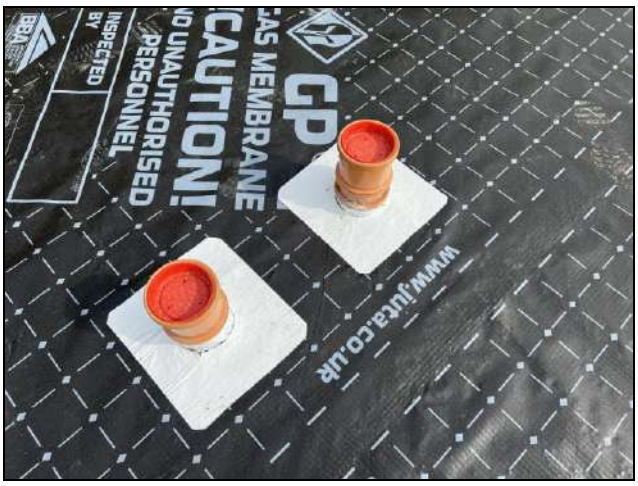


Photograph 3: Showing the heat sealed jointing of the membrane on Plots 11-12 as witnessed by Coopers on 19th July 2022.



Photograph 4: Showing the gas membrane sealed to a dual service entry point as per Coopers detail on Plots 11-12 as witnessed by Coopers on 19th July 2022.

DEVELOPMENT NAME:	"Coed Issa" Parc Brymbo, Wrexham	Validation Certificate Approved By	MAW



Photograph 5: Showing the gas membrane sealed to a service entry point as per Coopers detail on Plots 11-12 as witnessed by Coopers on 19th July 2022.



Photograph 6: Showing the general condition of the gas membrane installation on Plot 30 as witnessed by Coopers on 19th July 2022.



Photograph 3: Showing the gas membrane spanning the external walls on Plot 30 as witnessed by Coopers on 19th July 2022.



Photograph 4: Showing the heat sealed jointing of the membrane on Plot 30 as witnessed by Coopers on 19th July 2022.



Photograph 5: Showing the gas membrane sealed to a dual service entry point as per Coopers detail on Plot 30 as witnessed by Coopers on 19th July 2022.



Photograph 6: Showing the gas membrane sealed to a service entry point as per Coopers detail on Plot 30 as witnessed by Coopers on 19th July 2022.

Coopers confirm the gas mitigation measures were installed in accordance with the approved construction details for these plots. More photographs are available upon request.

Documents appended:

1. Coopers Gas Mitigation Inspection Record Sheet Plots 11-12, dated 19th July 2022.
2. Coopers Gas Mitigation Inspection Record Sheet Plot 30, dated 19th July 2022.

Footnote: -

It is advisable that this document is forwarded to the local authority environmental health department and the relevant warranty provider's engineering department for their approval. This Report is a record of Coopers' inspection on the dates given within the aforementioned text. Coopers undertake inspections when requested by the developer. Compliance or non-compliance of the criteria is ascertained on those dates only. Coopers cannot be held responsible for any subsequent actions by third parties not under Coopers direct supervision, which may compromise the integrity of the gas precaution measures after the date of validation.

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GAS MITIGATION INSPECTION RECORD SHEET

PROJECT NAME:	: Heritage way, Bagmbo		
DATE OF INSPECTION:	: 19/7/22	**PROJECT No.:**	7565
INSPECTED BY:	: ST	**PLOT No. INSPECTED:**	11-12

	INSPECTED ITEM	✓/X/n/a	REMARKS
	GAS MEMBRANE		
1	Product Identification *(membrane & tapes)*	✓	Black Jute Cap/ Gas membrane & Jute Self Adhesive Membrane.
2	General Condition	✓	Good - only minor defects. Fixed during visit.
3	Membrane Subgrade	✓	Semi SMH Sapt. One puncture due to debris on Subgrade.
4	Jointing/Welds	✓	Heat Sealed.
5	Creases/Folds	✓	None encountered.
6	Service Entry Points	✓	Sealed out of Jute Self Adhesive membrane.
7	Corner Sections	✓	See #6.
8	Reinforcement Spacers	N/A	N/A
9	Membrane Dirt/Debris	✓	Clean all aspects visible.
10	Puncture Repairs	✓	1 reported, patched with a sufficient section of self adhesive membrane.
11	Party Walls	✓	Spans party wall.
12	Door Thresholds	✓	See #6.
13	Cavity Inspection	✓	Spans external wall cavity on all 4 sides.
14	Internal Garage	N/A	N/A
a)	Sloping Floor		
b)	Internal Walls		
c)	External Walls		
d)	Pillars		
	PASSIVE VENTING		
15	External Wall Venting	N/A	N/A
16	Subfloor Venting Type Checked	N/A	N/A
17	Subfloor Venting Thickness	N/A	N/A
18	Internal/Partition Wall Venting	N/A	N/A

***Final Remarks/Additional Notes:**

INSPECTION APPROVAL	COMPLETE ONE BOX:
The inspection has PASSED in accordance to all items of the inspection	
The inspection has PASSED. Attention is drawn to item Numbers: 3	✓
The inspection has FAILED due to issues with items Numbers: (an additional visit is required)	

SIGNED:

Site Manager: (Print Name) [redacted] ...

Verification Engineer: (Print [redacted] ...

Please note that this inspection record sheet is not valid if not read in conjunction with Coopers corresponding Validation Report.

Park House, Sandpiper Court, Chester Business Park, Chester, CH4 9QU

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GAS MITIGATION INSPECTION RECORD SHEET

PROJECT NAME:	: Heritage Way, Brympton		
DATE OF INSPECTION:	: 14/7/22	**PROJECT No.:**	7565
INSPECTED BY:	: ST	**PLOT No. INSPECTED:**	30

	INSPECTED ITEM	✓/X/n/a	REMARKS
	GAS MEMBRANE		
1	Product Identification *(membrane & tapes)*	✓	Black Sika GP1 membrane + Sika self Adhesive membrane
2	General Condition	✓	Good - no defects.
3	Membrane Subgrade	✓	Semi stiff Cat F
4	Jointing/Welds	✓	Heat Sealed.
5	Creases/Folds	✓	None
6	Service Entry Points	✓	Formed out of Sika self-adhesive membrane
7	Corner Sections	✓	See #6.
8	Reinforcement Spacers	N/A	N/A
9	Membrane Dirt/Debris	✓	Clean
10	Puncture Repairs	✓	None required
11	Party Walls	✓	Spans internal walls.
12	Door Thresholds	✓	See #6.
13	Cavity Inspection	✓	Spans outer cavity on all 4 sides.
14	Internal Garage	N/A	N/A
a)	Sloping Floor		
b)	Internal Walls		
c)	External Walls		
d)	Pillars		
	PASSIVE VENTING		
15	External Wall Venting	N/A	N/A
16	Subfloor Venting Type Checked	N/A	N/A
17	Subfloor Venting Thickness	N/A	N/A
18	Internal/Partition Wall Venting	N/A	N/A

***Final Remarks/Additional Notes:**

INSPECTION APPROVAL	COMPLETE ONE BOX:
The inspection has PASSED in accordance to all items of the inspection	✓
The inspection has PASSED. Attention is drawn to item Numbers:	
The inspection has FAILED due to issues with items Numbers: (an additional visit is required)	

SIGNED:

Site Manager: (Print Name [redacted]

Verification Engineer: (Pr [redacted]

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