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Document Verification

Project Title	"*Coed Issa*" Parc Brymbo, Wrexham
Project Number	7565
Document Title	Gas Membrane Validation Report for Plots 32 & 52-53
Document Number	7565gval_plots 32 & 52-53
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 32 & 52-53	28/07/2022	Gas Membrane Validation Report for Plots 32 & 52-53	S Thomas	M A Wall

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 32 & 52-53

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	Visqueen	Gas Barrier
Gas Membrane	JUTA	GP1
Detailing Strip	Visqueen	Detailing Strip (or Pro Detailing Strip)
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*

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

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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 & JUTA GP1 membranes which comprise 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 Plot 32 as witnessed by Coopers on 19th July 2022.



Photograph 2: Showing the gas membrane spanning the external walls on Plot 32 as witnessed by Coopers on 19th July 2022.



Photograph 3: Showing the heat sealed jointing of the membrane on Plot 32 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 Plot 32 as witnessed by Coopers on 19th July 2022.

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



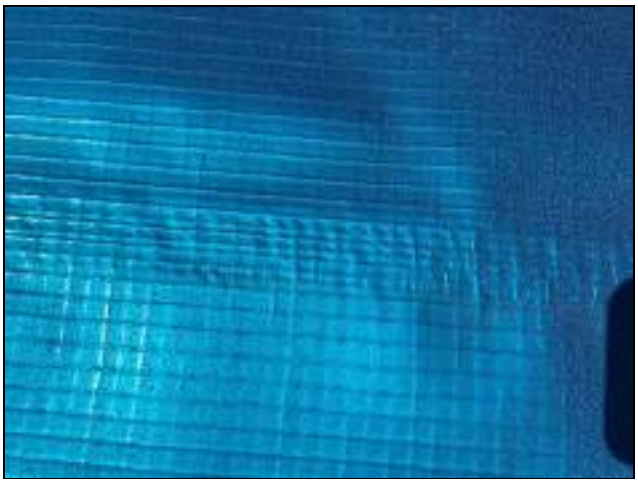
Photograph 5: Showing the gas membrane sealed to a service entry point as per Coopers detail on Plot 32 as witnessed by Coopers on 19th July 2022.



Photograph 6: Showing the general condition of the gas membrane installation on Plots 52-53 as witnessed by Coopers on 8th July 2022.



Photograph 3: Showing the gas membrane spanning the external walls on Plots 52-53 as witnessed by Coopers on 8th July 2022.



Photograph 4: Showing the heat sealed jointing of the membrane on Plots 52-53 as witnessed by Coopers on 8th July 2022.



Photograph 5: Showing the gas membrane sealed to a dual service entry point as per Coopers detail on Plots 52-53 as witnessed by Coopers on 8th July 2022.



Photograph 6: Showing the gas membrane sealed to a service entry point as per Coopers detail on Plots 52-53 as witnessed by Coopers on 8th 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 Plot 32, dated 19th July 2022.
2. Coopers Gas Mitigation Inspection Record Sheet Plots 52-53, dated 8th 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, Begnals		
DATE OF INSPECTION:	: 19/7/22	**PROJECT No.:**	7505
INSPECTED BY:	: ST	**PLOT No. INSPECTED:**	32

	INSPECTED ITEM	✓/X/n/a	REMARKS
			GAS MEMBRANE
1	Product Identification *(membrane & tapes)*	✓	Black Jata GPI & Jata Self Adhesive membrane.
2	General Condition	✓	Good - no defects.
3	Membrane Subgrade	✓	Semi-stiff felt.
4	Jointing/Welds	✓	Heat Sealed.
5	Creases/Folds	✓	None.
6	Service Entry Points	✓	Formed from Jata 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 external wall cavity on all 4 sides.
14	Internal Garage		
a)	Sloping Floor	N/A	N/A
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: (P[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 09730420.

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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:	: HERITAGE WAY BRYNMAWR		
DATE OF INSPECTION:	: 07/07/2022	**PROJECT No.:**	7565
INSPECTED BY:	: LP	**PLOT No. INSPECTED:**	52-53

	INSPECTED ITEM	✓/X/n/a	REMARKS
	GAS MEMBRANE		
1	Product Identification *(membrane & tapes)*	✓	VISQUEEN PRO 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	✓	9 NO. S.E.P CONSTRUCTED USING PRO DETAIL STRIP
7	Corner Sections	✓	CONSTRUCTED USING VISQUEEN PRO DETAIL STRIP
8	Reinforcement Spacers	N/A	
9	Membrane Dirt/Debris	✓	CLEAN - V. LITTLE DIRT/DEBRIS
10	Puncture Repairs	✓	1 NO. REPAIR WITNESSED ON SITE.
11	Party Walls	✓	MEMBRANE RUNS BENEATH PARTY WALL.
12	Door Thresholds	✓	MEMBRANE STEPS UP INTO CAVITY WALL
13	Cavity Inspection	✓	MEMBRANE SPANS CAVITY ON ALL EX. 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: #10	✓
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]

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Document Verification

Project Title	"*Coed Issa*" Parc Brymbo, Wrexham
Project Number	7565
Document Title	Gas Membrane Validation Report for Plots 33-34 & 35
Document Number	7565gval_Plots 33-34 & 35
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

[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 33-34 & 35	02/08/2022	Gas Membrane Validation Report for Plots 33-34 & 35	L Phillips	M A Wall

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 33-34 & 35

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:

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 33-34 as witnessed by Coopers on 7th July 2022.



Photograph 2: Showing the gas membrane spanning the external walls on Plots 33-34, as witnessed by Coopers on 7th July 2022.



Photograph 3: Showing the heat sealed jointing of the gas membrane on Plots 33-34, 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 33-34, 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 33-34, as witnessed by Coopers on 7th July 2022.



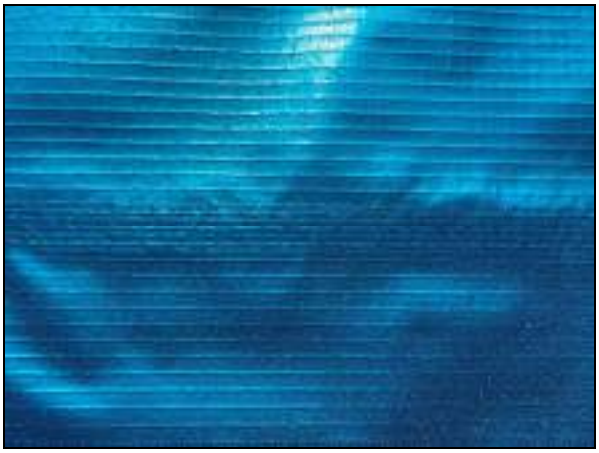
Photograph 6: Showing the gas membrane formed around a complex corner section as per Coopers detail on Plots 33-34, as witnessed by Coopers on 7th July 2022.



Photograph 7: Showing the general condition of the gas membrane installation on Plot 35, as witnessed by Coopers on 7th July 2022.



Photograph 8: Showing the gas membrane spanning the external walls on Plot 35, as witnessed by Coopers on 7th July 2022.



Photograph 9: Showing the heat sealed jointing of the gas membrane on Plots 35, 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 Plots 35, as witnessed by Coopers on 7th July 2022.



Photograph 11: Showing the gas membrane sealed to a dual service entry point as per Coopers detail on Plots 35, 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 Plots 35, 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 33-34, dated 7th July 2022.
2. Coopers Gas Mitigation Inspection Record Sheet Plots 35, 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:	: MENTALE WAY, BLYMBO		
DATE OF INSPECTION:	: 01/07/2022	**PROJECT No.:**	7565
INSPECTED BY:	: LP	**PLOT No. INSPECTED:**	33-34.

	INSPECTED ITEM	✓/X/n/a	REMARKS
	GAS MEMBRANE		
1	Product Identification *(membrane & tapes)*	✓	VISQUEEN GAS MEMBRANE + PRO DETAIL STRIP
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	✓	8 NO. S.E.P CONSTRUCTED USING VISQUEEN PRO DETAIL STRIP
7	Corner Sections	✓	CONSTRUCTED USING VISQUEEN PRO DETAIL STRIP
8	Reinforcement Spacers	N/A	
9	Membrane Dirt/Debris	✓	CLEAN ENOUGH TO INSPECT - SOME DIRT TO PLACES
10	Puncture Repairs	✓	NO PUNCTURE REPAIRS REQ.
11	Party Walls	✓	MEMBRANE RUNS FLAT BENEATH PARTY WALL
12	Door Thresholds	✓	MEMBRANE STEPS UP INTO CAVITY
13	Cavity Inspection	✓	MEMBRANE SPANS CAVITY ON ALL EXTERNAL WALLS
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: (Prin[redacted]

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

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Company number 09730429.

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GAS MITIGATION INSPECTION RECORD SHEET

PROJECT NAME:	: HERITAGE WAY, BRYNMOR		
DATE OF INSPECTION:	: 07/07/2022	**PROJECT No.:**	7565
INSPECTED BY:	: LP	**PLOT No. INSPECTED:**	35

	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 TO MEMBRANE SEE #10.
3	Membrane Subgrade	✓	RAFT
4	Jointing/Welds	✓	HEAT WELDED JOINTS
5	Creases/Folds	✓	NO CREASES/FOLDS OVER JOINTS.
6	Service Entry Points	✓	3 NO. S.E.P CONSTRUCTED USING PRO DETAIL STRIP.
7	Corner Sections	✓	CONSTRUCTED USING VISQUEEN PRO DETAIL STRIP.
8	Reinforcement Spacers	N/A	
9	Membrane Dirt/Debris	✓	VERY LITTLE DIRT/DEBRIS ON MEMBRANE
10	Puncture Repairs	✓	1 NO. PUNCTURE DEBRIS BENEATH MEMBRANE. REPAIR - WITNESSED ON SITE.
11	Party Walls	N/A	
12	Door Thresholds	✓	MEMBRANE STEPS UP INTO CAVITY.
13	Cavity Inspection	✓	MEMBRANE SPANS CAVITY WALL ON ALL EX. 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: #10.	✓
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]

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Document Verification

Project Title	"*Coed Issa*" Parc Brymbo, Wrexham
Project Number	7565
Document Title	Gas Membrane Validation Report for Plots 36-37
Document Number	7565gval_Plots 36-37
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, MIEnvSc, FGS

Checked and Approved



BSc (Hons), MIEnvSc, FGS

Document Revision

Report Reference	Date	Description	Prepared	Checked and Approved
7565gval_Plots 36-37	22/07/2024	Gas Membrane Validation Report for Plots 36-37	S L Dodd	M A Wall

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 36-37

Developer	Taylor Wimpey North-West
Site Name	"*Coed Issa*" Parc Brymbo, Wrexham
NHBC Site Reference	ENGPROJ/274367
Date of Report:	22nd July 2024

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 (delete applicable)

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. Stepped Slab	*Check sufficient overlap of gas membrane to span the step between plots. Particular attention to be paid to the formation of corners to the external walls in line with Plot specific construction detail.*
a) Wall Ties	*Check sealing of wall ties as per plot specific construction detail at approximately 0.9m centres. Take photographs of all wall ties and distances between each ensure detail strip secured to tie – refer to detail.*
16. 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).*
17. 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*
18. 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.*
19. 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 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 Plot 36, as witnessed by Coopers on 26th April 2024.



Photograph 2: Showing the gas membrane spanning the external walls on Plot 36, as witnessed by Coopers on 26th April 2024.



Photograph 3: Showing the heat sealed jointing of the membrane on Plot 36, as witnessed by Coopers on 26th April 2024.



Photograph 4: Showing the gas membrane sealed to a service entry point as per Coopers detail on Plot 36, as witnessed by Coopers on 26th April 2024.



Photograph 5: Showing the gas membrane sealed to a dual service entry point as per Coopers detail on Plot 36, as witnessed by Coopers on 26th April 2024.



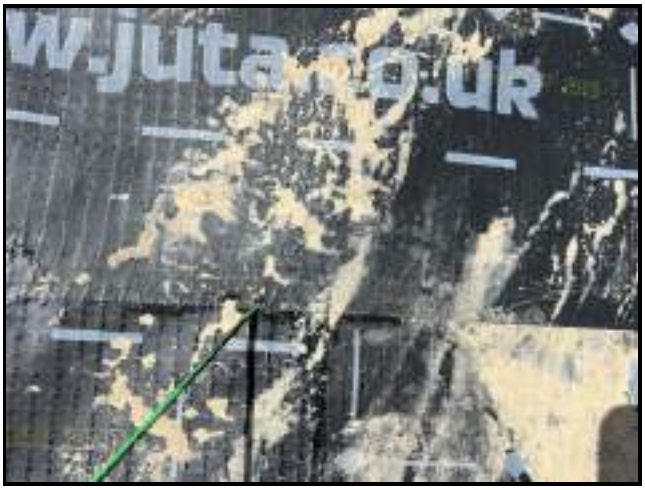
Photograph 6: Showing the formation of the gas membrane around a complex corner section on Plot 36, as witnessed by Coopers on 26th April 2024.



Photograph 7: Showing the formation of the gas membrane around the garage pillars on Plot 36, as witnessed by Coopers on 26th April 2024.



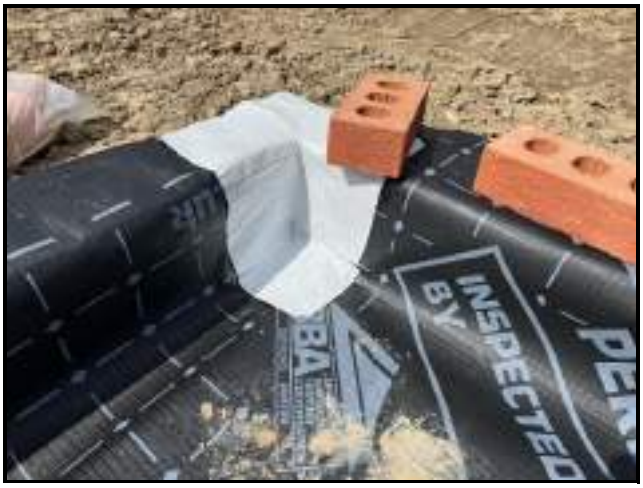
Photograph 8: Showing the general condition of the gas membrane installation on Plot 37, as witnessed by Coopers on 26th April 2024.



Photograph 9: Showing the heat sealed jointing of the membrane on Plot 37, as witnessed by Coopers on 26th April 2024.



Photograph 10: Showing the gas membrane spanning the external walls on Plot 37, as witnessed by Coopers on 26th April 2024.



Photograph 11: Showing the formation of the gas membrane around the garage pillars on Plot 37, as witnessed by Coopers on 26th April 2024.



Photograph 12: Showing the gas membrane sealed to a service entry point as per Coopers detail on Plot 37, as witnessed by Coopers on 26th April 2024.



Photograph 13: Showing the gas membrane sealed to a dual service entry point as per Coopers detail on Plot 37, as witnessed by Coopers on 26th April 2024.



Photograph 14: Showing the formation of the gas membrane around a complex corner section on Plot 37, as witnessed by Coopers on 26th April 2024.

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 Plot 36, dated 26th April 2024.
2. Coopers Gas Mitigation Inspection Record Sheet Plot 37, dated 26th April 2024.

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:	: Park Regnbo, Wrexham		
DATE OF INSPECTION:	: 26/4/24	**PROJECT No.:**	7565
INSPECTED BY:	: ST	**PLOT No. INSPECTED:**	36

	INSPECTED ITEM	✓/X/n/a	REMARKS
			GAS MEMBRANE
1	Product Identification *(membrane & tapes)*	✓	Tuta GSP1 mb Tuta SAm.
2	General Condition	✓	Good - no defects.
3	Membrane Subgrade	✓	Raft - concrete.
4	Jointing/Welds	✓	Heat welded.
5	Creases/Folds	✓	None.
6	Service Entry Points	✓	Formed from Tuta SAm.
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	✓	Detached plot.
12	Door Thresholds	✓	None present.
13	Cavity Inspection	✓	Spms extend with cavity on all 4 sides.
14	Internal Garage	✓	Present
a)	Sloping Floor	N/A	N/A
b)	Internal Walls	✓	Spay.
c)	External Walls	✓	Spms cavity
d)	Pillars	✓	NS pol detail.
15	Stepped Slab	N/A	N/A
a)	Wall Ties		
			PASSIVE VENTING
16	External Wall Venting	N/A	N/A
17	Subfloor Venting Type Checked	↓	↓
18	Subfloor Venting Thickness		
19	Internal/Partition Wall Venting		↓

***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	

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

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GAS MITIGATION INSPECTION RECORD SHEET

PROJECT NAME:	: Pace Bromborough, Wirral		
DATE OF INSPECTION:	: 26/4/24	**PROJECT No.:**	7565
INSPECTED BY:	: ST	**PLOT No. INSPECTED:**	37

	INSPECTED ITEM	✓/X/n/a	REMARKS
	GAS MEMBRANE		
1	Product Identification *(membrane & tapes)*	✓	Sure GPI & Sika Sam.
2	General Condition	✓	Good - only one defect.
3	Membrane Subgrade	✓	Ref - concrete.
4	Jointing/Welds	✓	Heat welded. One damaged weld patched with Sam.
5	Creases/Folds	✓	None.
6	Service Entry Points	✓	Boxed from Sika SAM.
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	✓	Detached plot.
12	Door Thresholds	✓	None present.
13	Cavity Inspection	✓	Spray external wall cavity on all 4 sides.
14	Internal Garage	✓	Present
a)	Sloping Floor	N/A	N/A
b)	Internal Walls	✓	Spray
c)	External Walls	✓	Spray cavity
d)	Pillars	✓	As per detail
15	Stepped Slab	N/A	N/A
a)	Wall Ties		
	PASSIVE VENTING		
16	External Wall Venting	N/A	N/A
17	Subfloor Venting Type Checked	↓	↓
18	Subfloor Venting Thickness	↓	↓
19	Internal/Partition Wall Venting	↓	↓

***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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Document Verification

Project Title	"*Coed Issa*" Parc Brymbo, Wrexham
Project Number	7565
Document Title	Gas Membrane Validation Report for Plots 38-43
Document Number	7565gval_plots 38-43
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

[redacted]

MEng (Hons),

Checked and Approved

[redacted]

M A Wall
BSc (Hons), MIEnvSc, FGS

Document Revision

Report Reference	Date	Description	Prepared	Checked and Approved
7565gval_plots 38-43	22/07/2024	Gas Membrane Validation Report for Plots 38-43	L Phillips	M A Wall



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GAS MEMBRANE VALIDATION REPORT FOR PLOTS 38-43

Developer	Taylor Wimpey North-West
Site Name	"*Coed Issa*" Parc Brymbo, Wrexham
NHBC Site Reference	ENGPROJ/274367
Date of Report:	22nd July 2024

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. Stepped Slab	*Check sufficient overlap of gas membrane to span the step between plots. Particular attention to be paid to the formation of corners to the external walls in line with Plot specific construction detail.*
a) Wall Ties	*Check sealing of wall ties as per plot specific construction detail at approximately 0.9m centres. Take photographs of all wall ties and distances between each ensure detail strip secured to tie – refer to detail.*
16. 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).*
17. 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*
18. 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.*
19. 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 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 38-39 as witnessed by Coopers on 25th June 2024.



Photograph 2: Showing the gas membrane spanning the external walls on Plots 38-39, as witnessed by Coopers on 25th June 2024.



Photograph 3: Showing the heat sealed jointing of the membrane on Plots 38-39 as witnessed by Coopers on 25th June 2024.



Photograph 4: Showing the gas membrane sealed to a dual service entry point as per Coopers detail on Plots 38-39 as witnessed by Coopers on 25th June 2024.



Photograph 5: Showing the gas membrane sealed to a service entry point as per Coopers detail on Plots 38-39 as witnessed by Coopers on 25th June 2024.



Photograph 6: Showing the formation of the gas membrane around a complex corner section on Plots 38-39 as witnessed by Coopers on 25th June 2024.



Photograph 7: Showing the general condition of the gas membrane installation on Plots 40-41 as witnessed by Coopers on 25th June 2024.



Photograph 8: Showing the gas membrane spanning the external walls on Plots 40-41, as witnessed by Coopers on 25th June 2024.



Photograph 9: Showing the heat sealed jointing of the membrane on Plots 40-41 as witnessed by Coopers on 25th June 2024.



Photograph 10: Showing the gas membrane sealed to a dual service entry point as per Coopers detail on Plots 40-41 as witnessed by Coopers on 25th June 2024.



Photograph 11: Showing the gas membrane sealed to a service entry point as per Coopers detail on Plots 40-41 as witnessed by Coopers on 25th June 2024.



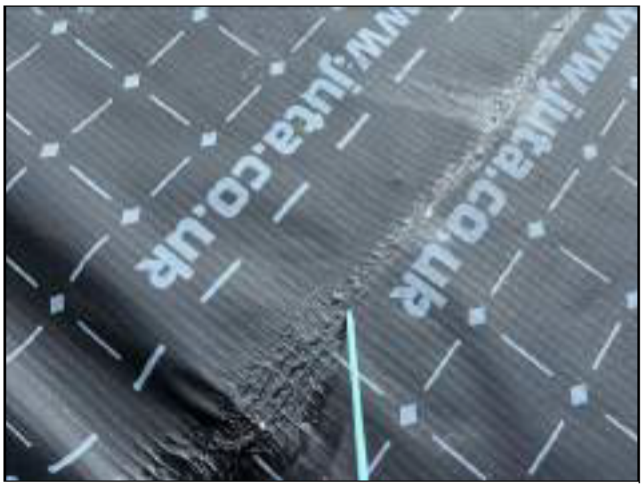
Photograph 12: Showing the formation of the gas membrane around a complex corner section on Plots 40-41 as witnessed by Coopers on 25th June 2024.



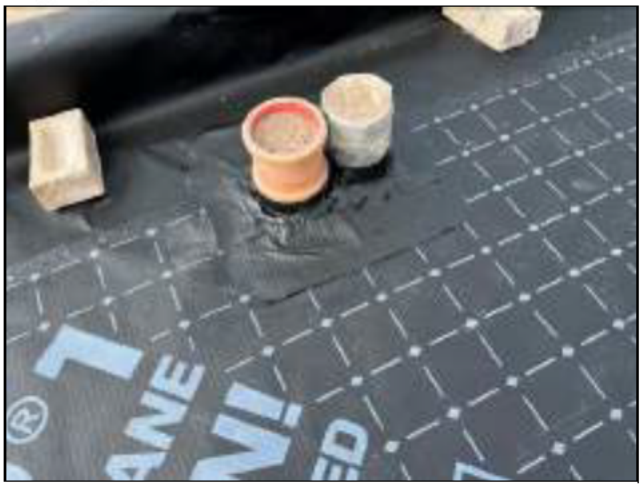
Photograph 13: Showing the general condition of the gas membrane installation on Plots 42-43 as witnessed by Coopers on 25th June 2024.



Photograph 14: Showing the gas membrane spanning the external walls on Plots 42-43, as witnessed by Coopers on 25th June 2024.



Photograph 15: Showing the heat sealed jointing of the membrane on Plots 42-43 as witnessed by Coopers on 25th June 2024.



Photograph 16: Showing the gas membrane sealed to a dual service entry point as per Coopers detail on Plots 42-43 as witnessed by Coopers on 25th June 2024.



Photograph 17: Showing the gas membrane sealed to a service entry point as per Coopers detail on Plots 42-43 as witnessed by Coopers on 25th June 2024.



Photograph 18: Showing the formation of the gas membrane around a complex corner section on Plots 42-43 as witnessed by Coopers on 25th June 2024.

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 38-39, dated 25th June 2024.
2. Coopers Gas Mitigation Inspection Record Sheet Plots 40-41, dated 25th June 2024.
3. Coopers Gas Mitigation Inspection Record Sheet Plots 42-43, dated 25th June 2024.

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, Biggin		
DATE OF INSPECTION:	: 25/6/24	**PROJECT No.:**	7565
INSPECTED BY:	: ST	**PLOT No. INSPECTED:**	38-39

	INSPECTED ITEM	✓/X/n/a	REMARKS
	GAS MEMBRANE		
1	Product Identification *(membrane & tapes)*	✓	Black Tuta CP1 gas membrane.
2	General Condition	✓	Good - no defects
3	Membrane Subgrade	✓	Semi stiff Clay
4	Jointing/Welds	✓	Heat welded
5	Creases/Folds	✓	None.
6	Service Entry Points	✓	Formed from Tuta S.A.M.
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 party wall.
12	Door Thresholds	✓	None.
13	Cavity Inspection	✓	Spans Extend well Cavity on CLI & Sides
14	Internal Garage	N/A	N/A
a)	Sloping Floor	↓	↓
b)	Internal Walls		
c)	External Walls		
d)	Pillars		
15	Stepped Slab	N/A	N/A
a)	Wall Ties		
	PASSIVE VENTING		
16	External Wall Venting	N/A	N/A
17	Subfloor Venting Type Checked	N/A	N/A
18	Subfloor Venting Thickness	N/A	N/A
19	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: (Print

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

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Company number 09738429.

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email: admin@coopers.co.uk

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GAS MITIGATION INSPECTION RECORD SHEET

PROJECT NAME:	: Heritage way, Begonia		
DATE OF INSPECTION:	: 25/6/14	**PROJECT No.:**	7565
INSPECTED BY:	: ST	**PLOT No. INSPECTED:**	40-44

	INSPECTED ITEM	✓/X/n/a	REMARKS
	GAS MEMBRANE		
1	Product Identification *(membrane & tapes)*	✓	Black Intu GPI and Intu S.A.M.
2	General Condition	✓	Good - no defects.
3	Membrane Subgrade	✓	Semi SNU - Cell
4	Jointing/Welds	✓	Heat welded.
5	Creases/Folds	✓	None.
6	Service Entry Points	✓	Formed from Intu S.A.M.
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 party wall.
12	Door Thresholds	✓	None.
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	↓	↓
15	Stepped Slab	N/A	N/A
a)	Wall Ties	N/A	N/A
	PASSIVE VENTING		
16	External Wall Venting	N/A	N/A
17	Subfloor Venting Type Checked	N/A	N/A
18	Subfloor Venting Thickness	N/A	N/A
19	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: (Print Name [redacted]

Park House, Sandpiper Court,
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GAS MITIGATION INSPECTION RECORD SHEET

PROJECT NAME:	: Heritage Way, Bexhill		
DATE OF INSPECTION:	: 23/6/14	**PROJECT No.:**	7565
INSPECTED BY:	: ST	**PLOT No. INSPECTED:**	42-43

	INSPECTED ITEM	✓/X/n/a	REMARKS
	GAS MEMBRANE		
1	Product Identification *(membrane & tapes)*	✓	Black Jute GPI & Jute S.A.M.
2	General Condition	✓	Good - no defects.
3	Membrane Subgrade	✓	Semi Stiff Craft.
4	Jointing/Welds	✓	Heat welded by MWW Contractor.
5	Creases/Folds	✓	None.
6	Service Entry Points	✓	Found at of Jute S.A.M.
7	Corner Sections	✓	See #6.
8	Reinforcement Spacers	N/A	N/A
9	Membrane Dirt/Debris	✓	Clean, all aspects visible.
10	Puncture Repairs	✓	None required
11	Party Walls	✓	Spans party wall.
12	Door Thresholds	✓	None.
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	↓	↓
15	Stepped Slab	N/A	N/A
a)	Wall Ties	N/A	N/A
	PASSIVE VENTING		
16	External Wall Venting	N/A	N/A
17	Subfloor Venting Type Checked	N/A	N/A
18	Subfloor Venting Thickness	N/A	N/A
19	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 requir[redacted]	

SIGNED:

Site Manager: (Print Name[redacted]

Verification Engineer: (Pri[redacted]

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 44-46
Document Number	7565gval_Plots 44-46
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, MIEnvSc, FGS

Checked and Approved



M A Wall
BSc (Hons), MIEnvSc, FGS

Document Revision

Report Reference	Date	Description	Prepared	Checked and Approved
7565gval_Plots 44-46	22/07/2024	Gas Membrane Validation Report for Plots 44-46	S L Dodd	M A Wall

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 44-46

Developer	Taylor Wimpey North-West
Site Name	"*Coed Issa*" Parc Brymbo, Wrexham
NHBC Site Reference	ENGPROJ/274367
Date of Report:	22nd July 2024

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 (delete applicable)

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. Stepped Slab	*Check sufficient overlap of gas membrane to span the step between plots. Particular attention to be paid to the formation of corners to the external walls in line with Plot specific construction detail.*
a) Wall Ties	*Check sealing of wall ties as per plot specific construction detail at approximately 0.9m centres. Take photographs of all wall ties and distances between each ensure detail strip secured to tie – refer to detail.*
16. 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).*
17. 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*
18. 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.*
19. 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 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 Plot 44, as witnessed by Coopers on 26th April 2024.



Photograph 2: Showing the gas membrane spanning the external walls on Plot 44, as witnessed by Coopers on 26th April 2024.



Photograph 3: Showing the heat sealed jointing of the membrane on Plot 44, as witnessed by Coopers on 26th April 2024.



Photograph 4: Showing the gas membrane sealed to a service entry point as per Coopers detail on Plot 44, as witnessed by Coopers on 26th April 2024.



Photograph 5: Showing the gas membrane sealed to a dual service entry point as per Coopers detail on Plot 44, as witnessed by Coopers on 26th April 2024.



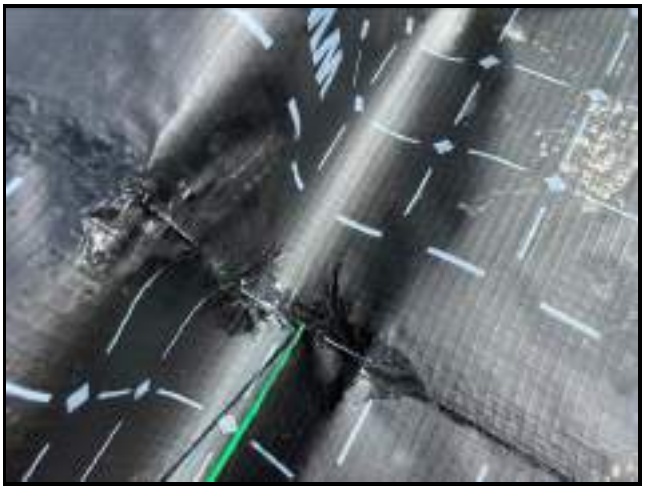
Photograph 6: Showing the formation of the gas membrane around a complex corner section on Plot 44, as witnessed by Coopers on 26th April 2024.



Photograph 7: Showing the formation of the gas membrane around the garage pillars on Plot 44, as witnessed by Coopers on 26th April 2024.



Photograph 8: Showing the general condition of the gas membrane installation on Plots 45-46, as witnessed by Coopers on 26th April 2024.



Photograph 9: Showing the heat sealed jointing of the membrane on Plots 45-46, as witnessed by Coopers on 26th April 2024.



Photograph 10: Showing the gas membrane spanning the external walls on Plots 45-46, as witnessed by Coopers on 26th April 2024.



Photograph 11: Showing the fixture of an issue with the heat sealing Plots 45-46, as witnessed by Coopers on 26th April 2024.



Photograph 12: Showing the gas membrane sealed to a service entry point as per Coopers detail on Plots 45-46, as witnessed by Coopers on 26th April 2024.



Photograph 13: Showing the gas membrane sealed to a dual service entry point as per Coopers detail on Plots 45-46, as witnessed by Coopers on 26th April 2024.



Photograph 14: Showing the formation of the gas membrane around a complex corner section on Plots 45-46, as witnessed by Coopers on 26th April 2024.

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 Plot 44, dated 26th April 2024.
2. Coopers Gas Mitigation Inspection Record Sheet Plots 45-46, dated 26th April 2024.

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 Begunbo, Wrexham.		
DATE OF INSPECTION:	: 26/4/24	**PROJECT No.:**	7565
INSPECTED BY:	: ST	**PLOT No. INSPECTED:**	44

	INSPECTED ITEM	✓/X/n/a	REMARKS
	GAS MEMBRANE		
1	Product Identification *(membrane & tapes)*	✓*	Juta GPI & Juta Sam.
2	General Condition	✓	Good, no defects.
3	Membrane Subgrade	✓	Ref - Concrete.
4	Jointing/Welds	✓	Heat welded.
5	Creases/Folds	✓	None.
6	Service Entry Points	✓	Foamed from Juta Sam.
7	Corner Sections	✓	See #6.
8	Reinforcement Spacers	N/A	N/A
9	Membrane Dirt/Debris	✓	Clean, all aspects visible.
10	Puncture Repairs	✓	None required.
11	Party Walls	✓	Detached plot.
12	Door Thresholds	✓	None present.
13	Cavity Inspection	✓	Spans external wall cavity on all four sides.
14	Internal Garage	✓	Present.
a)	Sloping Floor	N/A	N/A
b)	Internal Walls	✓	Spans internal walls, cavity
c)	External Walls	✓	Spans cavity.
d)	Pillars	✓	Extended around pillars.
15	Stepped Slab	N/A	N/A
a)	Wall Ties	N/A	N/A
	PASSIVE VENTING		
16	External Wall Venting	N/A	N/A
17	Subfloor Venting Type Checked	↓	↓
18	Subfloor Venting Thickness		
19	Internal/Partition Wall Venting		

***Final Remarks/Additional Notes:** * A product visit without Juta branding was checked and confirmed to be Juta therefore compatible.

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: 1	✓
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:	: Peace Pegasus Workers		
DATE OF INSPECTION:	: 26/4/24	**PROJECT No.:**	7565
INSPECTED BY:	: ST	**PLOT No. INSPECTED:**	45-46

	INSPECTED ITEM	✓/X/n/a	REMARKS
	GAS MEMBRANE		
1	Product Identification *(membrane & tapes)*	✓	Tuta LTP1 & Tuta SAM.
2	General Condition	✓	Good - only one minor damage.
3	Membrane Subgrade	✓	Raft - Concrete.
4	Jointing/Welds	✓	Heat welded by MW QA lvl contractor.
5	Creases/Folds	✓	None.
6	Service Entry Points	✓	Formed from Tuta SAM.
7	Corner Sections	✓	See #6.
8	Reinforcement Spacers	N/A	N/A
9	Membrane Dirt/Debris	✓	Clean.
10	Puncture Repairs	✓	One nr. puncture repaired with Tuta SAM.
11	Party Walls	✓	Spans internal/party walls.
12	Door Thresholds	✓	None present.
13	Cavity Inspection	✓	Spans extend well cavity on all four sides.
14	Internal Garage	N/A	N/A
a)	Sloping Floor	↓	↓
b)	Internal Walls	↓	↓
c)	External Walls	↓	↓
d)	Pillars	↓	↓
15	Stepped Slab	N/A	N/A
a)	Wall Ties	↓	↓
	PASSIVE VENTING		
16	External Wall Venting	N/A	N/A
17	Subfloor Venting Type Checked	↓	↓
18	Subfloor Venting Thickness	↓	↓
19	Internal/Partition Wall Venting	↓	↓

***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]

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

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Document Verification

Project Title	"*Coed Issa*" Parc Brymbo, Wrexham
Project Number	7565
Document Title	Gas Membrane Validation Report for Plots 47-48
Document Number	7565gval_Plots 47-48
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

[redacted]

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

Checked and Approved

[redacted]

M A Wall
BSc (Hons), MIEnvSc, FGS

Document Revision

Report Reference	Date	Description	Prepared	Checked and Approved
7565gval_Plots 47-48	22/07/2024	Gas Membrane Validation Report for Plots 47-48	S L Dodd	M A Wall

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 47-48

Developer	Taylor Wimpey North-West
Site Name	"*Coed Issa*" Parc Brymbo, Wrexham
NHBC Site Reference	ENGPROJ/274367
Date of Report:	22nd July 2024

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 (delete applicable)

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. Stepped Slab	*Check sufficient overlap of gas membrane to span the step between plots. Particular attention to be paid to the formation of corners to the external walls in line with Plot specific construction detail.*
a) Wall Ties	*Check sealing of wall ties as per plot specific construction detail at approximately 0.9m centres. Take photographs of all wall ties and distances between each ensure detail strip secured to tie – refer to detail.*
16. 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).*
17. 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*
18. 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.*
19. 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*

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 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.

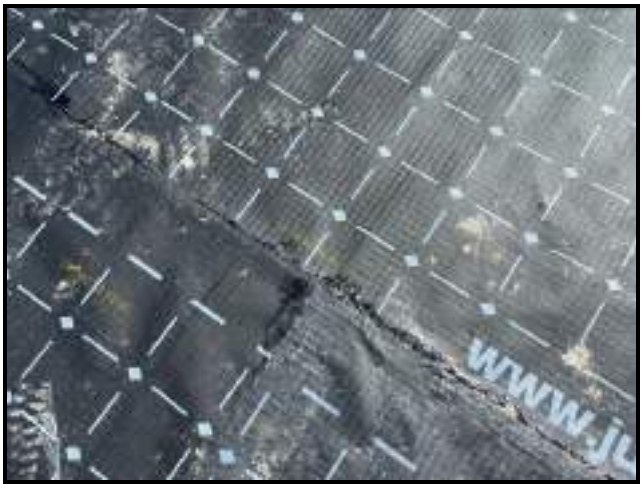
PHOTOGRAPHIC RECORDS OF TYPICAL INSTALLATION



Photograph 1: Showing the general condition of the gas membrane installation on Plot 47, as witnessed by Coopers on 26th April 2024.



Photograph 2: Showing the gas membrane spanning the external walls on Plot 47, as witnessed by Coopers on 26th April 2024.



Photograph 3: Showing the heat sealed jointing of the membrane on Plot 47, as witnessed by Coopers on 26th April 2024.



Photograph 4: Showing the gas membrane sealed to a service entry point as per Coopers detail on Plot 47, as witnessed by Coopers on 26th April 2024.



Photograph 5: Showing the gas membrane sealed to a dual service entry point as per Coopers detail on Plot 47, as witnessed by Coopers on 26th April 2024.



Photograph 6: Showing the formation of the gas membrane around a complex corner section on Plot 47, as witnessed by Coopers on 26th April 2024.



Photograph 7: Showing the general condition of the gas membrane installation on Plot 48, as witnessed by Coopers on 26th April 2024.



Photograph 8: Showing the gas membrane spanning the external walls on Plot 48, as witnessed by Coopers on 26th April 2024.



Photograph 9: Showing the heat sealed jointing of the membrane on Plot 48, as witnessed by Coopers on 26th April 2024.



Photograph 10: Showing the gas membrane sealed to a service entry point as per Coopers detail on Plot 48, as witnessed by Coopers on 26th April 2024.



Photograph 11: Showing the gas membrane sealed to a dual service entry point as per Coopers detail on Plot 48, as witnessed by Coopers on 26th April 2024.



Photograph 12: Showing the formation of the gas membrane around a complex corner section on Plot 48, as witnessed by Coopers on 26th April 2024.

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 Plot 47, dated 26th April 2024.
2. Coopers Gas Mitigation Inspection Record Sheet Plot 48, dated 26th April 2024.

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:	: Pace Bromsgrove, Worcs		
DATE OF INSPECTION:	: 26/4/24	**PROJECT No.:**	7565
INSPECTED BY:	: SP	**PLOT No. INSPECTED:**	47

	INSPECTED ITEM	✓/X/n/a	REMARKS
	GAS MEMBRANE		
1	Product Identification *(membrane & tapes)*	✓	Jutta GP1 & Jutta SAM.
2	General Condition	✓	Good - No defects.
3	Membrane Subgrade	✓	Ref - Concrete.
4	Jointing/Welds	✓	Heat Sealed.
5	Creases/Folds	✓	None.
6	Service Entry Points	✓	Formed from Jutta SAM.
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	✓	Detached plot.
12	Door Thresholds	✓	None present.
13	Cavity Inspection	✓	Spurs extend with cavity on all 4 sides.
14	Internal Garage	N/A	N/A
a)	Sloping Floor	↓	↓
b)	Internal Walls		
c)	External Walls		
d)	Pillars		
15	Stepped Slab	N/A	N/A
a)	Wall Ties		
	PASSIVE VENTING		
16	External Wall Venting	N/A	N/A
17	Subfloor Venting Type Checked	↓	↓
18	Subfloor Venting Thickness		
19	Internal/Partition Wall Venting		

***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

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GAS MITIGATION INSPECTION RECORD SHEET

PROJECT NAME:	: Puce Regatta, Wrexham.		
DATE OF INSPECTION:	: 26/4/24	**PROJECT No.:**	7565
INSPECTED BY:	: ST	**PLOT No. INSPECTED:**	48

	INSPECTED ITEM	✓/X/n/a	REMARKS
	GAS MEMBRANE		
1	Product Identification *(membrane & tapes)*	✓*	Juta CRPI & Juta SAm.
2	General Condition	✓	Good - only 2 minor defects.
3	Membrane Subgrade	✓	Raft - concrete.
4	Jointing/Welds	✓	Heat welded.
5	Creases/Folds	✓	None.
6	Service Entry Points	✓	Formed from Juta SAm.
7	Corner Sections	✓	See #6.
8	Reinforcement Spacers	N/A	N/A
9	Membrane Dirt/Debris	✓	Clean.
10	Puncture Repairs	✓	2 No. punctures repaired with Juta SAtape.
11	Party Walls	✓	Detached plot.
12	Door Thresholds	✓	None.
13	Cavity Inspection	✓	Spans extend wall cavity on all four sides.
14	Internal Garage	✓	Present.
a)	Sloping Floor	N/A	N/A
b)	Internal Walls	✓	Spans.
c)	External Walls	✓	Spans cavity.
d)	Pillars	✓	As detail.
15	Stepped Slab	N/A	N/A
a)	Wall Ties	N/A	N/A
	PASSIVE VENTING		
16	External Wall Venting	N/A	N/A
17	Subfloor Venting Type Checked	↓	↓
18	Subfloor Venting Thickness	↓	↓
19	Internal/Partition Wall Venting	↓	↓

***Final Remarks/Additional Notes:** * A product used without Juta branding was checked and confirmed to be Juta fleece compatible.

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 1	✓
The inspection has FAILED due to issues with items Numbers (an additional visit is required)	

SIGNED:

Site Manager: (Print Name) [redacted]

Verification Engineer: (Print N[redacted]

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

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Document Verification

Project Title	"*Coed Issa*" Parc Brymbo, Wrexham
Project Number	7565
Document Title	Gas Membrane Validation Report for Plot 49-51
Document Number	7565gval_plots 49-51
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

[redacted]

S Thomas
BSc (Hons), MSc

Checked and Approved

[redacted]

M A Wall
BSc (Hons), FGS

Document Revision

Report Reference	Date	Description	Prepared	Checked and Approved
7565gval_plots 49-51	28/07/2022	Gas Membrane Validation Report for Plots 49-51	S Thomas	M A Wall

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.

GAS MEMBRANE VALIDATION REPORT FOR PLOTS 49-51

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*

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

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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 49-50 as witnessed by Coopers on 19th July 2022.



Photograph 2: Showing the gas membrane spanning the external walls on Plots 49-50 as witnessed by Coopers on 19th July 2022.

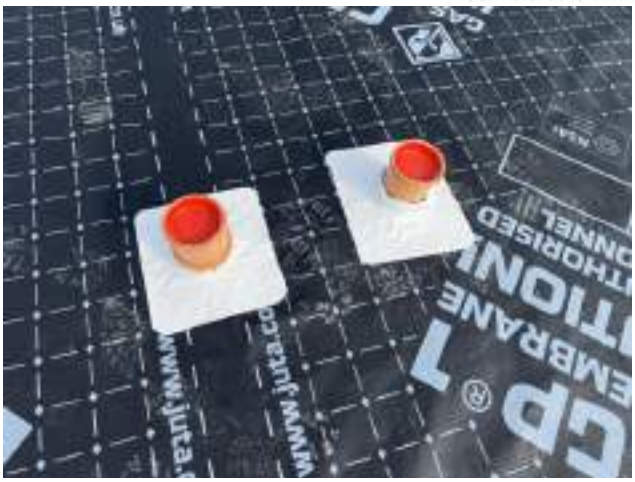


Photograph 3: Showing the heat sealed jointing of the membrane on Plots 49-50 as witnessed by Coopers on 19th July 2022.



Photograph 4: Showing the gas membrane sealed to a dual service entry point as per Coopers detail on Plots 49-50 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 49-50 as witnessed by Coopers on 19th July 2022.



Photograph 6: Showing the general condition of the gas membrane installation on Plot 51 as witnessed by Coopers on 19th July 2022.



Photograph 7: Showing the gas membrane spanning the external walls on Plot 51 as witnessed by Coopers on 19th July 2022.



Photograph 8: Showing the heat sealed jointing of the membrane on Plot 51 as witnessed by Coopers on 19th July 2022.



Photograph 9: Showing the gas membrane sealed to a dual service entry point as per Coopers detail on Plot 51 as witnessed by Coopers on 19th July 2022.



Photograph 10: Showing the gas membrane sealed to a service entry point as per Coopers detail on Plot 51 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 49-50, dated 19th July 2022.
2. Coopers Gas Mitigation Inspection Record Sheet Plot 51, 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, Bryncoch		
DATE OF INSPECTION:	: 19/7/12	**PROJECT No.:**	7565
INSPECTED BY:	: ST	**PLOT No. INSPECTED:**	4-9-50

	INSPECTED ITEM	✓/X/n/a	REMARKS
	GAS MEMBRANE		
1	Product Identification *(membrane & tapes)*	✓	Black Visqueen GP1 Gas membrane and Visqueen Self-Adhesive membrane.
2	General Condition	✓	Good - no defects.
3	Membrane Subgrade	✓	Semi-SMB Cast
4	Jointing/Welds	✓	Heat Sealed
5	Creases/Folds	✓	None.
6	Service Entry Points	✓	Formed from Visqueen 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	✓	None required.
11	Party Walls	✓	Spans party wall.
12	Door Thresholds	✓	See #6.
13	Cavity Inspection	✓	Spans external cavity on all 4 sides.
14	Internal Garage		
a)	Sloping Floor	N/A	N/A
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: (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:	: Hectare way, Reynho		
DATE OF INSPECTION:	: 19/7/22	**PROJECT No.:**	7565
INSPECTED BY:	: ST	**PLOT No. INSPECTED:**	59

	INSPECTED ITEM	✓/X/n/a	REMARKS
	GAS MEMBRANE		
1	Product Identification *(membrane & tapes)*	✓	Black Jute GP1 Gas membrane & Jute Self-Adhesive membrane.
2	General Condition	✓	Good - no defects.
3	Membrane Subgrade	✓	Semi - Stiff Soft.
4	Jointing/Welds	✓	Heat Sealed.
5	Creases/Folds	✓	None encountered.
6	Service Entry Points	✓	Formed using Jute Self-adhesive membrane.
7	Corner Sections	✓	See #6
8	Reinforcement Spacers	N/A	N/A
9	Membrane Dirt/Debris	✓	Clean, able to check all sections of install.
10	Puncture Repairs	✓	None required.
11	Party Walls	✓	Spans internal walls.
12	Door Thresholds	✓	See #6.
13	Cavity Inspection	✓	Spans the 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:	
The inspection has FAILED due to issues with items Numbers: (an additional visit is required)	

SIGNED:

Site Manager: (Print Name) [redacted]

Verification Engineer: (Print N[redacted]

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

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Document Verification

Project Title	"*Coed Issa*" Parc Brymbo, Wrexham
Project Number	7565
Document Title	Gas Membrane Validation Report for Plots 54-59
Document Number	7565gval_Plots 54-59
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 54-59	06/07/2022	Gas Membrane Validation Report for Plots 54-59	S L Dodd	M A Wall

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 54-59

Developer	Taylor Wimpey North-West
Site Name	"*Coed Issa*" Parc Brymbo, Wrexham
NHBC Site Reference	ENGPROJ/274367
Date of Report:	6th July 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 54-55 as witnessed by Coopers on 26th May 2022.



Photograph 2: Showing the gas membrane spanning the external walls on Plots 54-55, as witnessed by Coopers on 10th May 2022.



Photograph 3: Showing the heat sealed jointing of the membrane on Plots 54-55, as witnessed by Coopers on 26th May 2022.



Photograph 4: Showing the gas membrane sealed to a service entry point as per Coopers detail on Plots 54-55, 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 54-55, as witnessed by Coopers on 26th May 2022.



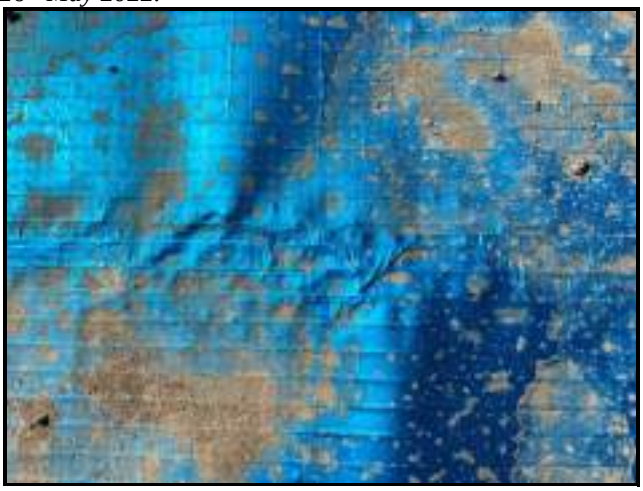
Photograph 6: Showing the general condition of the gas membrane installation on Plots 56-57 as witnessed by Coopers on 26th May 2022.



Photograph 7: Showing the gas membrane spanning the external walls on Plots 56-57, 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 Plots 56-57, as witnessed by Coopers on 26th May 2022.



Photograph 9: Showing the heat sealed jointing of the membrane on Plots 56-57, as witnessed by Coopers on 26th May 2022.



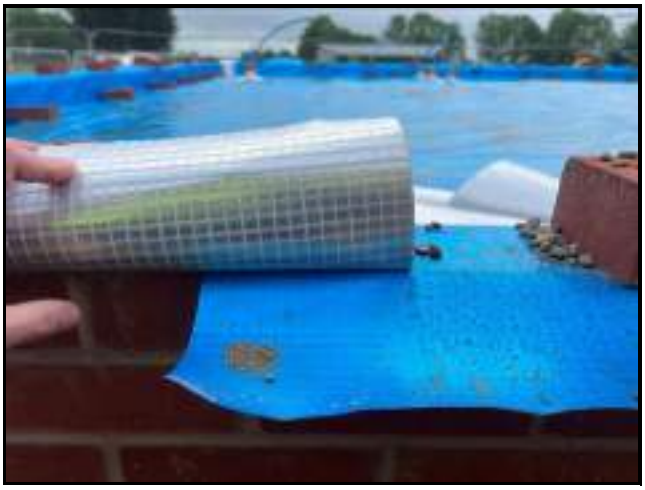
Photograph 10: Showing the gas membrane sealed to a dual service entry point as per Coopers detail on Plots 56-57, as witnessed by Coopers on 26th May 2022.



Photograph 11: Showing the general condition of the gas membrane installation on Plot 58 as witnessed by Coopers on 26th May 2022.



Photograph 12: Showing the gas membrane spanning the external walls on Plot 58, as witnessed by Coopers on 26th May 2022.



Photograph 13: Showing the heat sealed jointing of the membrane on Plot 58, as witnessed by Coopers on 26th May 2022.



Photograph 14: Showing the gas membrane formed around a complex corner section as per Coopers detail on Plot 58, as witnessed by Coopers on 26th May 2022.



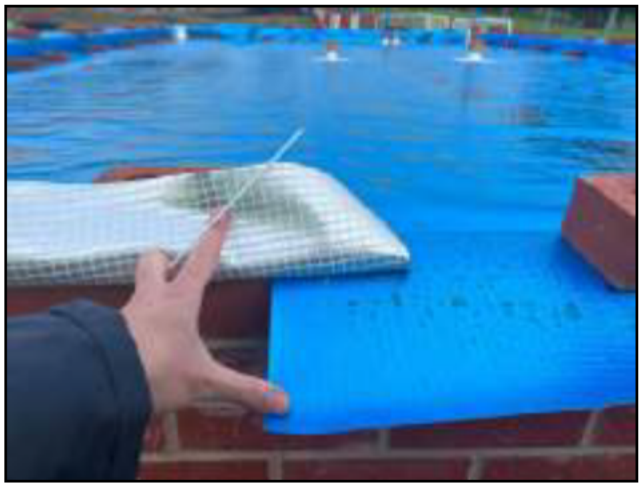
Photograph 15: Showing the gas membrane sealed to a dual service entry point as per Coopers detail on Plot 58, as witnessed by Coopers on 26th May 2022.



Photograph 16: Showing the general condition of the gas membrane installation on Plot 59 as witnessed by Coopers on 26th May 2022.



Photograph 17: Showing the gas membrane spanning the external walls on Plot 59, as witnessed by Coopers on 26th May 2022.



Photograph 18: Showing the heat sealed jointing of the membrane on Plot 59, as witnessed by Coopers on 26th May 2022.



Photograph 19: Showing the gas membrane sealed to a dual service entry point as per Coopers detail on Plot 59, as witnessed by Coopers on 26th May 2022.



Photograph 20: Showing the gas membrane formed around a complex corner section as per Coopers detail on Plot 59, 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 54-55 dated 26th May 2022.
2. Coopers Gas Mitigation Inspection Record Sheet Plots 56-57, dated 26th May 2022.
3. Coopers Gas Mitigation Inspection Record Sheet Plot 58, dated 26th May 2022.
4. Coopers Gas Mitigation Inspection Record Sheet Plot 59, 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.

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

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GAS MITIGATION INSPECTION RECORD SHEET

PROJECT NAME:	: Plot Bryntbo, Heritage Way, Bryntbo		
DATE OF INSPECTION:	: 26/5/22	**PROJECT No.:**	7565
INSPECTED BY:	: AW	**PLOT No. INSPECTED:**	54-55

	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 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	✓	Required sweeping in areas to be able to inspect
10	Puncture Repairs	✓	10 No. initial puncture repairs noted. 4 No. further repairs required following removal of loose chips beneath. All using detailing strip
11	Party Walls	✓	Membrane spanned across stepped party wall. No ties noted.
12	Door Thresholds	✓	Membrane brought up inside cavity. Spanned door threshold.
13	Cavity Inspection	✓	Membrane spanned cavity.
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:**

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: (Prin[redacted]

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

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GAS MITIGATION INSPECTION RECORD SHEET

PROJECT NAME:	: Parc Brynteg, Heritage Way, Brynteg		
DATE OF INSPECTION:	: 26/5/22	**PROJECT No.:**	7565
INSPECTED BY:	: AW	**PLOT No. INSPECTED:**	56-57

	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 at >100mm overlaps
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	✓	Required sweeping in areas to be able to inspect
10	Puncture Repairs	✓	21 No. initial repair patches noted on arrival. 4 No tears and 1 No. strip beneath membrane required repair. All repairs complete with detailing strip
11	Party Walls	✓	Membrane sparged across stepped party wall. No ties required.
12	Door Thresholds	✓	Membrane brought up inside cavity. Sparged door threshold
13	Cavity Inspection	✓	Membrane sparged cavity
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:

Advised to improve sweep of slabs to remove loose 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.

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GAS MITIGATION INSPECTION RECORD SHEET

PROJECT NAME:	: Parc Bryndu		
DATE OF INSPECTION:	: 26/5/22	**PROJECT No.:**	7565
INSPECTED BY:	: AW	**PLOT No. INSPECTED:**	58

	INSPECTED ITEM	✓/X/n/a	REMARKS
	GAS MEMBRANE		
1	Product Identification *(membrane & tapes)*	✓	Visqueen Gas Barrier + Pro detailing strip
2	General Condition	✓*	Good - Some surface gravel spill to clear up following adjacent drainage works
3	Membrane Subgrade	✓	Concrete raft
4	Jointing/Welds	✓	Joints welded with overlaps ≥ 150mm
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	✓	No repair of welded joint noted or evident. No further repairs needed. *using detail strip
11	Party Walls	N/A	
12	Door Thresholds	✓	Membrane brought up inside cavity. Spread threshold
13	Cavity Inspection	✓	Spread cavity
14	Internal Garage	Yes	
a)	Sloping Floor	✓	~~X~~ irrelevant as membrane brought up inside cavity. Not exposed
b)	Internal Walls	✓	Spread internal wall
c)	External Walls	✓	Spread out + 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:**

* Loose surface gravel spill from adjacent drainage works to clear up before placement of insulation.

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: 2	✓
The inspection has FAILED due to issues with items Numbers: (an additional visit is required)	

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

Verification Engineer: (Prin[redacted]

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GAS MITIGATION INSPECTION RECORD SHEET

PROJECT NAME:	: Parc Brynteg		
DATE OF INSPECTION:	: 26/5/22	**PROJECT No.:**	7565
INSPECTED BY:	: AW	**PLOT No. INSPECTED:**	59

	INSPECTED ITEM	✓/X/n/a	REMARKS
	GAS MEMBRANE		
1	Product Identification *(membrane & tapes)*	✓	Visqueen Gas Barrier + Pro detailing strip
2	General Condition	✓	Good
3	Membrane Subgrade	✓	Concrete slab
4	Jointing/Welds	✓	welded joints with > 100 mm overlap
5	Creases/Folds	✓	None noted
6	Service Entry Points	✓	Sealed with detailing strip
7	Corner Sections	✓	Sealed with detailing strip
8	Reinforcement Spacers	N/A	
9	Membrane Dirt/Debris	✓	Clean
10	Puncture Repairs	✓	2 No noted on joints on arrival using detailing strip No further repairs needed
11	Party Walls	N/A	
12	Door Thresholds	✓	Membrane brought up inside cavity spaced threshold
13	Cavity Inspection	✓	Cavity spanned
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 Nam[redacted]

Verification Engineer: ([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 60-62
Document Number	7565gval_plots 60-62
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

[redacted]

BSc (Hons), MSc

Checked and Approved

[redacted]

M Wall
BSc (Hons), FGS

Document Revision

Report Reference	Date	Description	Prepared	Checked and Approved
7565gval_plots 60-62	08/07/22	Gas Membrane Validation Report for Plots 60-62	S Thomas	M Wall

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.

GAS MEMBRANE VALIDATION REPORT FOR PLOTS 60-62

Developer	Taylor Wimpey North-West
Site Name	"*Coed Issa*" Parc Brymbo, Wrexham
NHBC Site Reference	ENGPROJ/274367
Date of Report:	8th July 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*

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

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.

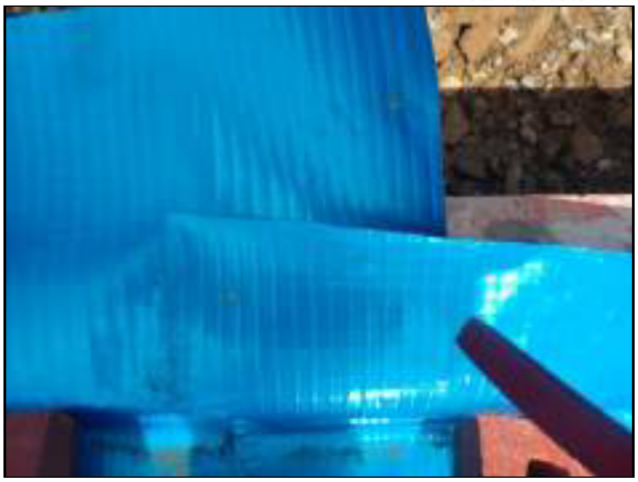
PHOTOGRAPHIC RECORDS OF TYPICAL INSTALLATION



Photograph 1: Showing the general condition of the gas membrane installation on Plots 60-61 as witnessed by Coopers on 6th April 2022.



Photograph 2: Showing the gas membrane spanning the external walls on Plots 60-61, as witnessed by Coopers on 6th April 2022.



Photograph 3: Showing the heat sealed jointing of the membrane on Plots 60-61, as witnessed by Coopers on 6th April 2022.



Photograph 4: Showing the gas membrane sealed to a dual service entry point as per Coopers detail on Plots 60-61, as witnessed by Coopers on 6th April 2022.



Photograph 5: Showing the gas membrane sealed to a service entry point as per Coopers detail on Plots 60-61, as witnessed by Coopers on 6th April 2022.



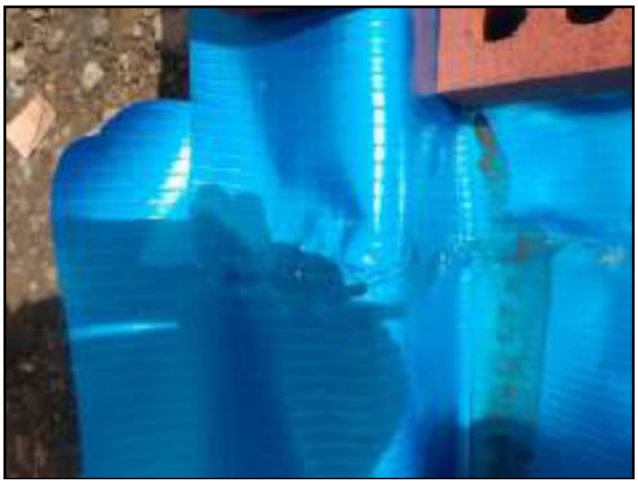
Photograph 6: An example of the correct Visqueen product labelling, as witnessed by Coopers on 6th April 2022.



Photograph 7: Showing the general condition of the gas membrane installation on Plot 62 as witnessed by Coopers on 6th April 2022.



Photograph 8: Showing the gas membrane spanning the external walls on Plot 62, as witnessed by Coopers on 6th April 2022.



Photograph 9: Showing the heat sealed jointing of the membrane on Plot 62, as witnessed by Coopers on 6th April 2022.



Photograph 10: Showing the gas membrane sealed to a dual service entry point as per Coopers detail on Plot 62, as witnessed by Coopers on 6th April 2022.



Photograph 11: Showing the gas membrane sealed to a service entry point as per Coopers detail on Plot 62, as witnessed by Coopers on 6th April 2022.



Photograph 12: An example of the correct Visqueen product labelling, as witnessed by Coopers on 6th April 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 60-61 dated 6th April 2022.
2. Coopers Gas Mitigation Inspection Record Sheet Plot 62 dated 6th April 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:	: Brambo Wrexham		
DATE OF INSPECTION:	: 6/4/22	**PROJECT No.:**	7565
INSPECTED BY:	: MW	**PLOT No. INSPECTED:**	60-61

	INSPECTED ITEM	✓/X/n/a	REMARKS
	GAS MEMBRANE		
1	Product Identification *(membrane & tapes)*	✓	Visqueen gas barrier and associated products
2	General Condition	✓	Good
3	Membrane Subgrade	✓	Raft
4	Jointing/Welds	✓	heat sealed
5	Creases/Folds	✓	None
6	Service Entry Points	✓	Formed using pro-detailing strip.
7	Corner Sections	✓	Formed using pro-detailing strip.
8	Reinforcement Spacers	N/A	
9	Membrane Dirt/Debris	✓	Clean
10	Puncture Repairs	✓	1no. puncture repair
11	Party Walls	N/A	
12	Door Thresholds	✓	see # 6+7
13	Cavity Inspection	✓	Specs Rally
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	↓	
17	Subfloor Venting Thickness		
18	Internal/Partition Wall Venting		

***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: 10	✓
The inspection has FAILED due to issues with items Numbers: (an additional visit is required)	

SIGNED:
Site Manager: (Print Name) …

Verification Engineer: (Print N[redacted]

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GAS MITIGATION INSPECTION RECORD SHEET

PROJECT NAME:	: Bryn Bo, Wrexham		
DATE OF INSPECTION:	: 6/4/22	**PROJECT No.:**	7565
INSPECTED BY:	: MW	**PLOT No. INSPECTED:**	62

	INSPECTED ITEM	✓/X/n/a	REMARKS
	GAS MEMBRANE		
1	Product Identification *(membrane & tapes)*	✓	Visqueen gas barrier and associated tapes
2	General Condition	✓	Good
3	Membrane Subgrade	✓	Raft
4	Jointing/Welds	✓	heat sealed
5	Creases/Folds	✓	None
6	Service Entry Points	✓	Formed using pro detailing strip.
7	Corner Sections	✓	Formed using pro-detailing strip.
8	Reinforcement Spacers	N/A	
9	Membrane Dirt/Debris	✓	Clean
10	Puncture Repairs	✓	None
11	Party Walls	N/A	
12	Door Thresholds	✓	See #6+7
13	Cavity Inspection	✓	Spans cavity fully.
14	Internal Garage	Yes	
a)	Sloping Floor	no	
b)	Internal Walls	✓	Spans
c)	External Walls	✓	spans
d)	Pillars	✓	Spans
	PASSIVE VENTING		
15	External Wall Venting	N/A	
16	Subfloor Venting Type Checked		
17	Subfloor Venting Thickness		
18	Internal/Partition Wall Venting	✓	

***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]

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Document Verification

Project Title	"*Coed Issa*" Parc Brymbo, Wrexham
Project Number	7565
Document Title	Gas Membrane Validation Report for Plots 64-66
Document Number	7565gval_Plots 64-66
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

[redacted]

S Thomas
BSc (Hons), MSc

Checked and Approved

[redacted]

M Wall
BSc (Hons), FGS

Document Revision

Report Reference	Date	Description	Prepared	Checked and Approved
7565gval_Plots 64-66	08/07/2022	Gas Membrane Validation Report for Plots 64-66	S Thomas	M Wall

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GAS MEMBRANE VALIDATION REPORT FOR PLOTS 64-66

Developer	Taylor Wimpey North-West
Site Name	"*Coed Issa*" Parc Brymbo, Wrexham
NHBC Site Reference	ENGPROJ/274367
Date of Report:	8th July 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*

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.

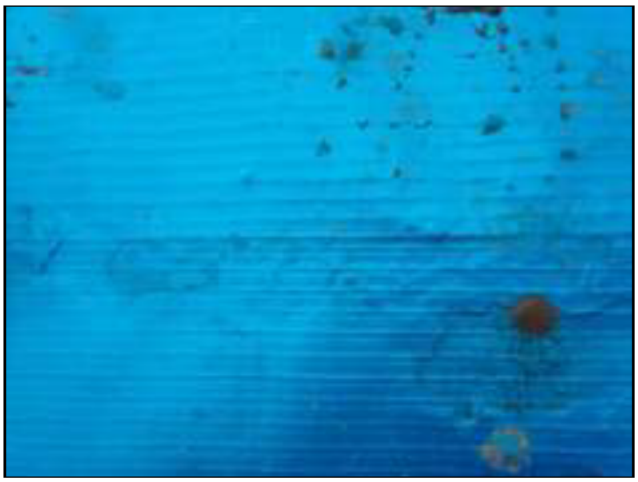
PHOTOGRAPHIC RECORDS OF TYPICAL INSTALLATION



Photograph 1: Showing the general condition of the gas membrane installation on Plots 64-65 as witnessed by Coopers on 6th April 2022.



Photograph 2: Showing the gas membrane spanning the external walls on Plots 64-65, as witnessed by Coopers on 6th April 2022.



Photograph 3: Showing the heat sealed jointing of the membrane on Plots 64-65, as witnessed by Coopers on 6th April 2022.



Photograph 4: Showing the gas membrane sealed to a dual service entry point as per Coopers detail on Plots 64-65, as witnessed by Coopers on 6th April 2022.



Photograph 5: Showing the gas membrane sealed to a service entry point as per Coopers detail on Plots 64-65, as witnessed by Coopers on 6th April 2022.



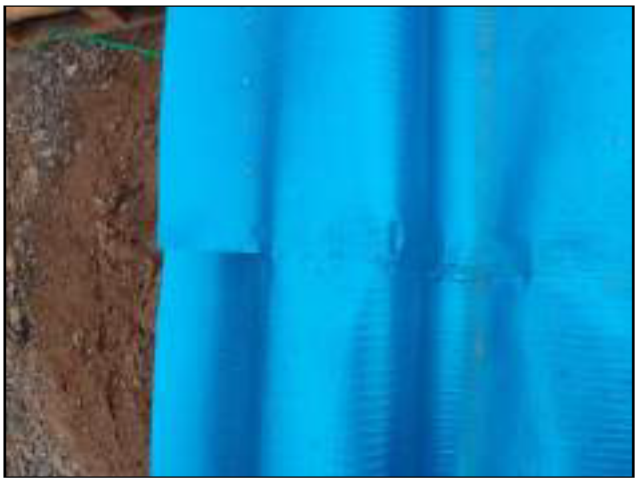
Photograph 6: An example of the correct Visqueen product labelling, as witnessed by Coopers on 6th April 2022.



Photograph 7: Showing the general condition of the gas membrane installation on Plot 66 as witnessed by Coopers on 10th March 2022.



Photograph 8: Showing the gas membrane spanning the external walls on Plots 66, as witnessed by Coopers on 10th March 2022.



Photograph 9: Showing the heat sealed jointing of the membrane on Plots 66, as witnessed by Coopers on 10th March 2022.



Photograph 10: Showing the gas membrane sealed to a dual service entry point as per Coopers detail on Plots 66, as witnessed by Coopers on 10th March 2022.



Photograph 11: Showing the gas membrane sealed to a service entry point as per Coopers detail on Plots 66, as witnessed by Coopers on 10th March 2022.



Photograph 12: An example of the correct Visqueen product labelling, as witnessed by Coopers on 10th March 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 64-65, dated 6th April 2022.
2. Coopers Gas Mitigation Inspection Record Sheet Plot 66, dated 10th March 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:	: Bowpo, Wrexham		
DATE OF INSPECTION:	: 6/4/22	**PROJECT No.:**	7565
INSPECTED BY:	: MN	**PLOT No. INSPECTED:**	64-65

	INSPECTED ITEM	✓/X/n/a	REMARKS
	GAS MEMBRANE		
1	Product Identification *(membrane & tapes)*	✓	Visqueen pro-detail strip + gas barrier.
2	General Condition	✓	Good
3	Membrane Subgrade	✓	Raft
4	Jointing/Welds	✓	heat sealed
5	Creases/Folds	✓	None
6	Service Entry Points	✓	Formed using pro-detailing strip.
7	Corner Sections	✓	Formed using pro-detailing strip.
8	Reinforcement Spacers	N/A	
9	Membrane Dirt/Debris	✓	Clean
10	Puncture Repairs	✓	2 No. punctures repaired
11	Party Walls	✓	Flat as per detail stepped plots 450mm.
12	Door Thresholds	N/A	
13	Cavity Inspection	✓	Spans cavity + external walls
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	↓	
17	Subfloor Venting Thickness		
18	Internal/Partition Wall Venting		

***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: 10	✓
The inspection has FAILED due to issues with items Numbers: (an additional visit is required)	

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

Verification Engineer: (Prin

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

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GAS MITIGATION INSPECTION RECORD SHEET

PROJECT NAME:	: Parc Bryn Iau		
DATE OF INSPECTION:	: 10/3/22	**PROJECT No.:**	7565
INSPECTED BY:	: MW	**PLOT No. INSPECTED:**	66

	INSPECTED ITEM	✓/X/n/a	REMARKS
	GAS MEMBRANE		
1	Product Identification *(membrane & tapes)*	✓	Visqueen gas barrier + associated tapes
2	General Condition	✓	Good
3	Membrane Subgrade	✓	Both
4	Jointing/Welds	✓	Heat sealed
5	Creases/Folds	✓	None
6	Service Entry Points	✓	Constructed using pro visqueen detail strip.
7	Corner Sections	✓	See #6
8	Reinforcement Spacers	N/A	
9	Membrane Dirt/Debris	✓	Clean
10	Puncture Repairs	✓	None
11	Party Walls	N/A	
12	Door Thresholds	N/A	
13	Cavity Inspection	✓	Fully + external walls
14	Internal Garage	No	
a)	Sloping Floor	↓	
b)	Internal Walls	↓	
c)	External Walls	↓	
d)	Pillars	↓	
	PASSIVE VENTING		
15	External Wall Venting	N/A	
16	Subfloor Venting Type Checked	↓	
17	Subfloor Venting Thickness	↓	
18	Internal/Partition Wall Venting	✓	

***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]

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

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Document Verification

Project Title	"*Coed Issa*" Parc Brymbo, Wrexham
Project Number	7565
Document Title	Gas Membrane Validation Report for Plots 67-70
Document Number	7565gval_Plots 67-70
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

[redacted]

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

Checked and Approved

[redacted]

M A Wall
BSc (Hons), FGS

Document Revision

Report Reference	Date	Description	Prepared	Checked and Approved
7565gval_Plots 67-70	06/07/2022	Gas Membrane Validation Report for Plots 67-70	S L Dodd	M A Wall

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.

GAS MEMBRANE VALIDATION REPORT FOR PLOTS 67-70

Developer	Taylor Wimpey North-West
Site Name	"*Coed Issa*" Parc Brymbo, Wrexham
NHBC Site Reference	ENGPROJ/274367
Date of Report:	06/07/2022

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	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 Plot 67 as witnessed by Coopers on 17th March 2022.



Photograph 2: Showing the gas membrane spanning the external walls on Plot 67, as witnessed by Coopers on 17th March 2022.



Photograph 3: Showing the heat sealed jointing of the membrane on Plot 67, as witnessed by Coopers on 17th March 2022.



Photograph 4: Showing the gas membrane sealed to a dual service entry point as per Coopers detail on Plot 67, as witnessed by Coopers on 17th March 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 Plot 67, as witnessed by Coopers on 17th March 2022.



Photograph 6: An example of the correct Visqueen product labelling, as witnessed by Coopers on 17th March 2022.



Photograph 7: Showing the general condition of the gas membrane installation on Plots 68-69 as witnessed by Coopers on 17th March 2022.



Photograph 8: Showing the gas membrane spanning the external walls on Plots 68-69, as witnessed by Coopers on 17th March 2022.



Photograph 9: Showing the heat sealed jointing of the membrane on Plots 68-69, as witnessed by Coopers on 17th March 2022.



Photograph 10: Showing the gas membrane sealed to a dual service entry point as per Coopers detail on Plot 68-69, as witnessed by Coopers on 17th March 2022.



Photograph 11: Showing the gas membrane formed around a complex corner section as per Coopers detail on Plots 68-69, as witnessed by Coopers on 17th March 2022.



Photograph 12: Showing the general condition of the gas membrane installation on Plot 70 as witnessed by Coopers on 17th March 2022.



Photograph 13: Showing the gas membrane spanning the external walls on Plots 70, as witnessed by Coopers on 17th March 2022.



Photograph 14: Showing the heat sealed jointing of the membrane on Plot 70, as witnessed by Coopers on 17th March 2022.



Photograph 15: Showing the gas membrane formed around a complex corner section as per Coopers detail on Plot 70, as witnessed by Coopers on 17th March 2022.



Photograph 16: Showing the gas membrane sealed to a service entry point as per Coopers detail on Plot 70, as witnessed by Coopers on 17th March 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 Plot 67, dated 17th March 2022.
2. Coopers Gas Mitigation Inspection Record Sheet Plots 68-69, dated 17th March 2022.
3. Coopers Gas Mitigation Inspection Record Sheet Plot 70, dated 17th March 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:	: Brando		
DATE OF INSPECTION:	: 18/3/22	**PROJECT No.:**	7565
INSPECTED BY:	: AW	**PLOT No. INSPECTED:**	67

	INSPECTED ITEM	✓/X/n/a	REMARKS
	GAS MEMBRANE		
1	Product Identification *(membrane & tapes)*	✓	Visqueen Ceos Barrier, pre detailing strip
2	General Condition	✓	Good
3	Membrane Subgrade	✓	Raft
4	Jointing/Welds	✓	Heat welded with overlaps >100 m. well sealed
5	Creases/Folds	✓	None
6	Service Entry Points	✓	Sealed with pre-detailing strip
7	Corner Sections	✓	Sealed with pre-detailing strip
8	Reinforcement Spacers	N/A	
9	Membrane Dirt/Debris	✓	Clean
10	Puncture Repairs	✓	15 No. noted using detailing strip, well sealed. Suspected due to raised hardspots from raft concrete.
11	Party Walls	N/A	
12	Door Thresholds	✓	Sealed with membrane + pre-detailing strip either side of garage door. Elsewhere NO seal needed as membrane brought up inside cavity
13	Cavity Inspection	✓	Spread across and up inside cavity
14	Internal Garage	✓	
a)	Sloping Floor	✓	Irrelevant as membrane brought up inside cavity
b)	Internal Walls	✓	Spread level at raft over internal wall
c)	External Walls	✓	Spread across and up inside cavity + ext. wall
d)	Pillars	✓	Sealed all sides with pre-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:**

Note 10- Improvement required to finish of raft concrete to avoid raised hardspots

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: 10	✓
The inspection has FAILED due to issues with items Numbers: (an additional visit is required)	

SIGNED:

Site Manager: (Print N[redacted]

Verification Engineer: [redacted]

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

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Chester, CH4 9QU

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GAS MITIGATION INSPECTION RECORD SHEET

PROJECT NAME:	: Brymbo		
DATE OF INSPECTION:	: 18/3/22	**PROJECT No.:**	7565
INSPECTED BY:	: AW	**PLOT No. INSPECTED:**	68-69

	INSPECTED ITEM	✓/X/n/a	REMARKS
	GAS MEMBRANE		
1	Product Identification *(membrane & tapes)*	✓	Visqueen Gas Barrier + Pro-detailing strip
2	General Condition	✓	Good
3	Membrane Subgrade	✓	Raft
4	Jointing/Welds	✓	Heat welded with overlap > 100mm . well sealed
5	Creases/Folds	✓	None noted
6	Service Entry Points	✓	Sealed with pro-detailing strip
7	Corner Sections	✓	Sealed with pro-detailing strip
8	Reinforcement Spacers	N/A	
9	Membrane Dirt/Debris	✓	Clean
10	Puncture Repairs	✓	6 No. repairs noted with pro-detailing strip. well sealed. Suspected due to raised hardspots in concrete of raft.
11	Party Walls	✓	Membrane sparred 1mal on raft accar party wall
12	Door Thresholds	✓	No door thresholds seal needed as membrane brought up inside cavity
13	Cavity Inspection	✓	Membrane Sparred accar out up inside cavity
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:**

Note 12. Improve raft surface finish to reduce raised hardspots

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: 10	✓
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:	: Brynbo		
DATE OF INSPECTION:	: 18/3/22	**PROJECT No.:**	7565
INSPECTED BY:	: AW	**PLOT No. INSPECTED:**	70

	INSPECTED ITEM	✓/X/n/a	REMARKS
	GAS MEMBRANE		
1	Product Identification *(membrane & tapes)*	✓	VB queen Gas Barrier, pro-detecting strip
2	General Condition	✓	Good
3	Membrane Subgrade	✓	Raft
4	Jointing/Welds	✓	Heat welded with >100mm overlap well sealed
5	Creases/Folds	✓	None noted
6	Service Entry Points	✓	Sealed with pro-detecting strip
7	Corner Sections	✓	Sealed with pro-detecting strip
8	Reinforcement Spacers	N/A	
9	Membrane Dirt/Debris	✓	Clean
10	Puncture Repairs	✓	None noted or needed
11	Party Walls	N/A	
12	Door Thresholds	✓	Membrane and pro-detecting strip sealed either end of garage door threshold. Flexible membrane inside cavity
13	Cavity Inspection	✓	Spread across and inside cavity
14	Internal Garage	✓	
a)	Sloping Floor	✓	irrelevant as membrane obstructed inside cavity
b)	Internal Walls	✓	Spread across int. wall level over raft
c)	External Walls	✓	Spread ext. wall inside and across cavity
d)	Pillars	✓	Sealed either side with pro-detecting 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:	
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]

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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