

Date: 22nd October 2024
Reference: 15-974 V16

GAS MEMBRANE VALIDATION – BENNETT STREET

Project Name:	Bennett Street
Project Number:	15-974
Client:	Kellen Homes
Date:	02-10-2024
Project Manager:	M. Dee
Engineer:	J. James
Ground Gas Risk Assessment:	Vapor Membranes Required
Gas Membrane Installers Name & Qualifications:	JCW Gas Membranes Ltd, NVQ Level 2 – Installation of Gas Membranes in Construction
Plot:	91-94, 97, 98

OVERVIEW

The membrane comprised a Juta TITANFLEX (black) gas and hydrocarbon barrier, in line with the required specification set out in the agreed Build Phase Contamination Risk Mitigation Strategy (report ref: 15-974-R5). E3P can confirm there were no holes or rips at the inspection time. Upon being laid, the membrane is to be covered with a Celotex (closed cell) floor insulation material which is considered to provide a high degree of protection.

E3P inspected all external joints, and E3P can confirm that the membrane was overlapped and welded. Corners and patch repairs were sealed with a GP TITAN butyl tape, resistant to vapour and bulk ground gas. Plots have service duct(s) located at the outer edge of the property. E3P inspected each one and can confirm that the top hats have been adequately sealed against the membrane using a self-adhesive gas style product and fixed with a layer of GP TITAN butyl tape.

As per the Build Phase Contamination Risk Mitigation Strategy (report ref: 15-974-R5), sub-floor voids require inspection and validation at 50% ratio of substructures completed. E3P previously undertook subfloor void inspections for plots 101-104, inspections confirmed there was a minimum void space of 150 mm for each plot. Validation photographs included within this letter.

Based on the information provided within this report, the site inspection and validation checklists, E3P can confirm that plots 91-94, 97, 98 have been installed with gas & vapour protection measures in line with the agreed Build Phase Contamination Risk Mitigation Strategy (report ref: 15-974-R5) to an acceptable level of workmanship.



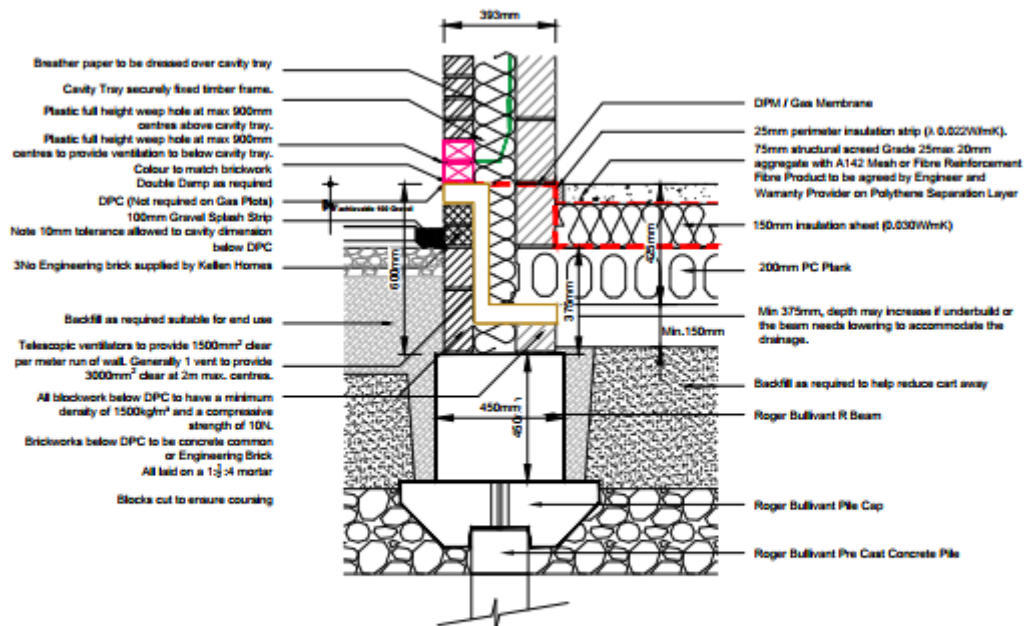


MEMBRANE SPECIFICATION: JUTA TITANFLEX (BLACK)

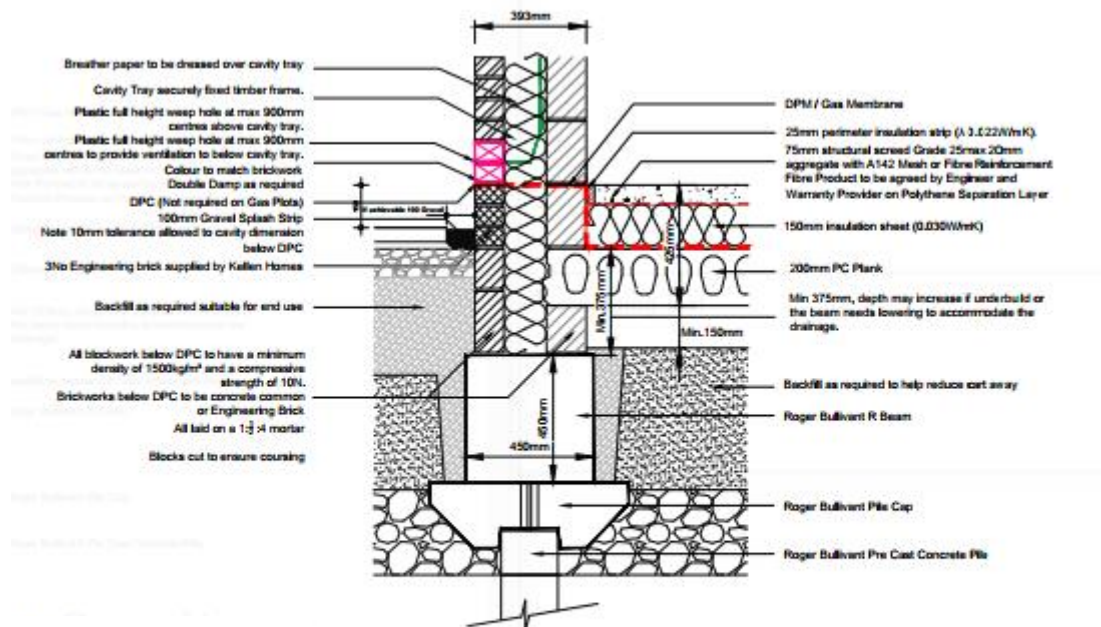
GROUND GAS PROTECTION GP[®] TITANFLEX[®] TECHNICAL DATA SHEET  GP[®] TITANFLEX[®]			
Feature	Characteristics	Test Method	GP [®] TITANFLEX [®]
Physical Properties	Thickness	EN 1849-2	0.5 mm
	Width	EN 1849-2	2 m
	Length	EN 1849-2	50 m
	Weight	EN 1849-2	500 g/m ²
Hydraulic Press	Water Vapour Transmission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



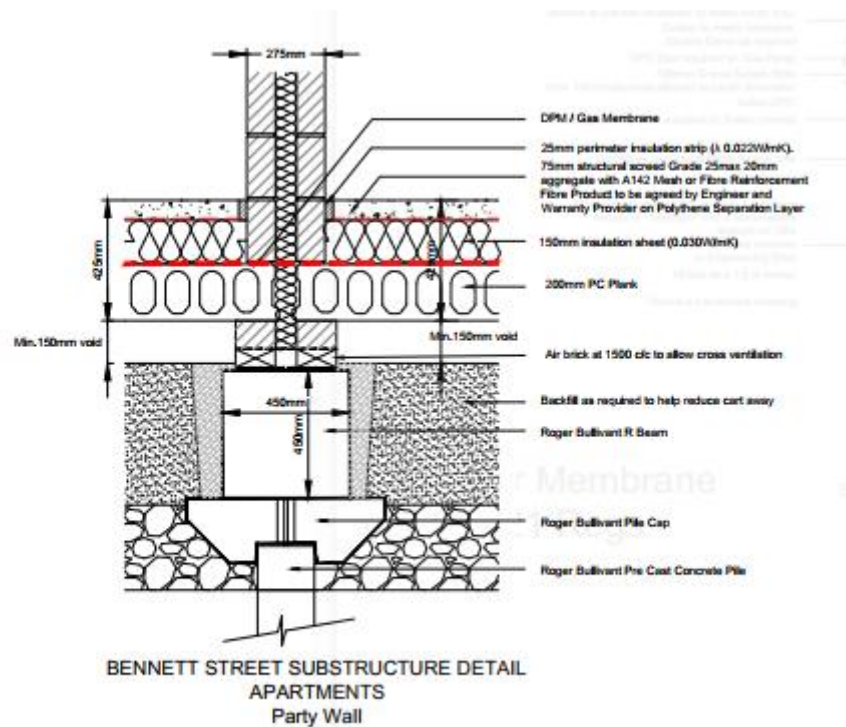
STRUCTURAL ENGINEER'S SUBSTRUCTURE DESIGN



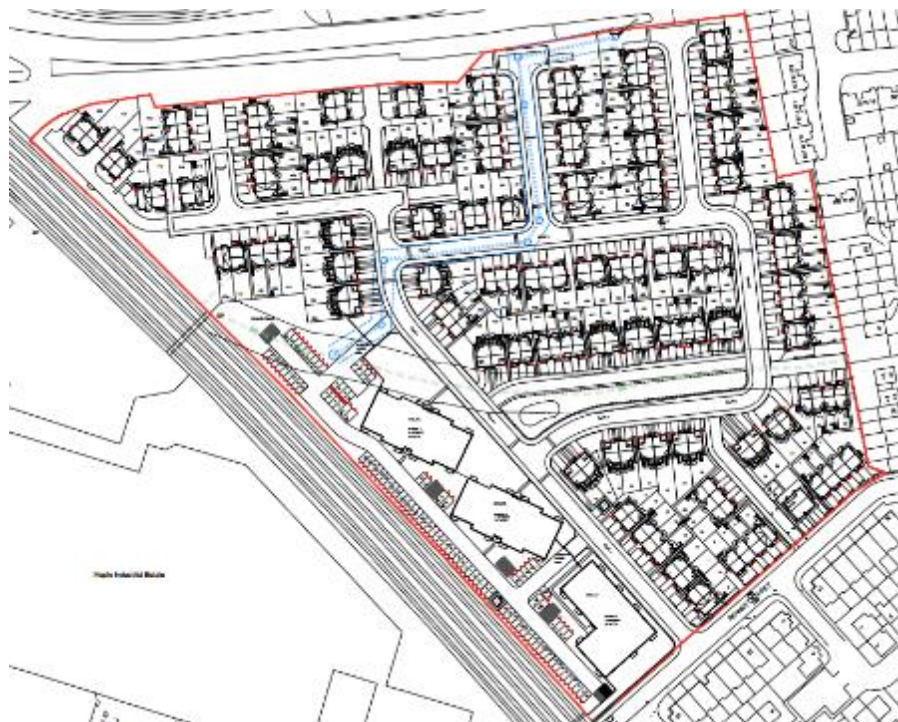
BENNETT STREET SUBSTRUCTURE DETAIL
APARTMENTS
Locations with Telescopic Vents



BENNETT STREET SUBSTRUCTURE DETAIL
APARTMENTS
Locations with Telescopic Vents



PROPOSED DEVELOPMENT PLAN





The gas membrane validation photographs are enclosed within this letter. For information, Table 1 includes references and validation dates of previously validated plots.

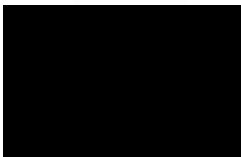
Table 1 – Validation Letter Reference

PLOT NUMBER	DATE	REPORT REFERENCE
9-15	19-10-2023	V1
16 & 17	24-10-2023	V2
18 & 19	01-11-2023	V3
Apartment Block 3	08-03-2024	V4
Apartment Block 1	14-03-2024	V5
Apartment Block 2	19-03-2024	V6
136-138 and 147-148	15-05-2024	V7
130-135	28-06-2024	V8
123-127	06-08-2024	V9
119-122	22-08-2024	V10
112-114	23-08-2024	V11
117-118	06-09-2024	V12
105 - 107	16-09-2024	V13
95, 96, 101-104, 128, 129	23-09-2024	V14
139-146	16-09-2024	V15
91-94, 97, 98	02-10-2024	V16

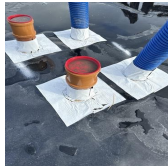


WELDED GAS MEMBRANE VALIDATION

Complete

Score	73 / 73 (100%)	Flagged items	0	Actions	0
Site Name	Bennett st				
Location	8 Lloyd Wright Avenue Manchester England M11 3NJ United Kingdom (53.4753440127024, - 2.2064839497447535)				
Project Manager	Matt Dee				
Project number	15974				
Developer	Kellen Homes				
Site representative Signature	 2 Oct 2024 10:59 AM BST				
Conducted on	2 Oct 2024 3:44 PM BST				
Prepared by	Jordan James				
Have you got the correct Gas Membrane detail (attached to the job in synergist)?	Yes				



Gas Membrane Inspection	72 / 72 (100%)
Plot Inspection	72 / 72 (100%)
Plot Inspection 1	12 / 12 (100%)
Plot Number	91
Type of Development: if other add Note	House
Floor Slab Type	Block and beam suspended
Are telescopic vents present?	Yes
Gas Membrane Type: Manufacturer, gauge, and colour. (Take photos where possible showing Label)	GP TITANFLEX
Installer's name, company and qualification	PRS
Gas Membrane Condition: Open punctures, tears, rips, stretching, Presence of debris, Repairs, Signs of weakness such as raised or sunken indentations, Protection plan in place to restrict access to laid gas membrane? IF FAIL DESCRIPTION IN ACTIONS AND PHOTOS REQUIRED	Pass
Are welds complete?	Yes
Are Joints lapped and sealed in accordance with manufacturer's requirements/ specification?	Yes
Service entries seals: Top hats seal arrangements fixed around service entries? Use of Jubilee clips or Bitumastic Sealant	Pass
     Photo 1 Photo 2 Photo 3 Photo 4 Photo 5	
Corners / Internal joints: Check all corners are correctly formed or contractor has used preformed corners.	Pass
    Photo 6 Photo 7 Photo 8 Photo 9	
Are folds running in line with joints? (no joints cutting across folds)	Pass



Extent of Coverage: Is the membrane covering the entire plot?
Does membrane span over outside walls?

Yes



Photo 10



Photo 11

Condition of sub-grade and underside of gas membrane: Check that the subgrade does not contain rough/uneven surfaces, is appropriately clean and that there are no hard/sharp objects. That protective sand blinding or geotextile (if specified) is present and meets the design criteria. (Lift back the membrane and photo the subfloor)

Pass

Slab / membrane condition (is membrane clear of snow, standing water, debris or insulation): Can membrane be fully seen and photographed – ask contractor to remove an debris so membrane can be fully seen an inspected – this is a requirement of NHBC and local authorities.

Pass

External Wall Air bricks: Numbers, size. positions as design drawing? (Minimum of 3 walls)

Pass



Photo 12

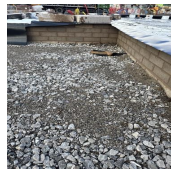


Photo 13

Plot Inspection 2

12 / 12 (100%)

Plot Number

92

Type of Development: if other add Note

House

Floor Slab Type

Block and beam suspended

Are telescopic vents present?

Yes

Gas Membrane Type: Manufacturer, gauge, and colour. (Take photos were possible showing Label)

GP TITANFLEX

Installer's name, company and qualification

PRS

Gas Membrane Condition: Open punctures, tears, rips, stretching, Presence of debris, Repairs, Signs of weakness such as raised or sunken indentations, Protection plan in place to restrict access to lain gas membrane? IF FAIL DESCRIPTION IN ACTIONS AND PHOTOS REQUIRED

Pass



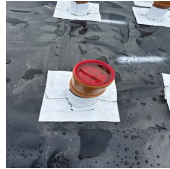
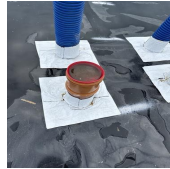
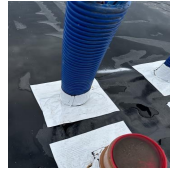
Are welds complete?	Yes
Are Joints lapped and sealed in accordance with manufacturer's requirements/ specification?	Yes
Service entries seals: Top hats seal arrangements fixed around service entries? Use of Jubilee clips or Bitumastic Sealant	Pass
      Photo 14 Photo 15 Photo 16 Photo 17 Photo 18 Photo 19	
Corners / Internal joints: Check all corners are correctly formed or contractor has used preformed corners.	Pass
     Photo 20 Photo 21 Photo 22 Photo 23 Photo 24	
Are folds running in line with joints? (no joints cutting across folds)	Pass
Extent of Coverage: Is the membrane covering the entire plot? Does membrane span over outside walls?	Yes
  Photo 25 Photo 26	
Condition of sub-grade and underside of gas membrane: Check that the subgrade does not contain rough/uneven surfaces, is appropriately clean and that there are no hard/sharp objects. That protective sand blinding or geotextile (if specified) is present and meets the design criteria. (Lift back the membrane and photo the subfloor)	Pass
Slab / membrane condition (is membrane clear of snow, standing water, debris or insulation): Can membrane be fully seen and photographed – ask contractor to remove an debris so membrane can be fully seen an inspected – this is a requirement of NHBC and local authorities.	Pass
External Wall Air bricks: Numbers, size. positions as design drawing? (Minimum of 3 walls)	Pass



Photo 27

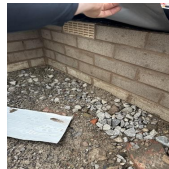


Photo 28

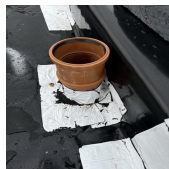
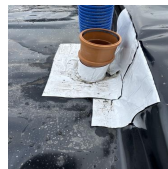
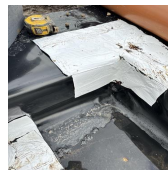
Plot Inspection 3		12 / 12 (100%)
Plot Number		93
Type of Development: if other add Note	House	
Floor Slab Type	Block and beam suspended	
Are telescopic vents present?	Yes	
Gas Membrane Type: Manufacturer, gauge, and colour. (Take photos where possible showing Label)	GP TITANFLEX	
Installer's name, company and qualification	PRS	
Gas Membrane Condition: Open punctures, tears, rips, stretching, Presence of debris, Repairs, Signs of weakness such as raised or sunken indentations, Protection plan in place to restrict access to laid gas membrane? IF FAIL DESCRIPTION IN ACTIONS AND PHOTOS REQUIRED	Pass	
Are welds complete?	Yes	
Are Joints lapped and sealed in accordance with manufacturer's requirements/ specification?	Yes	
Service entries seals: Top hats seal arrangements fixed around service entries? Use of Jubilee clips or Bitumastic Sealant	Pass	
     		
Corners / Internal joints: Check all corners are correctly formed or contractor has used preformed corners.	Pass	
     		



Photo 41



Photo 42



Photo 43



Photo 44



Photo 45



Photo 46

Are folds running in line with joints? (no joints cutting across folds)

Pass

Extent of Coverage: Is the membrane covering the entire plot?
Does membrane span over outside walls?

Yes



Photo 47



Photo 48

Condition of sub-grade and underside of gas membrane: Check that the subgrade does not contain rough/uneven surfaces, is appropriately clean and that there are no hard/sharp objects. That protective sand blinding or geotextile (if specified) is present and meets the design criteria. (Lift back the membrane and photo the subfloor)

Pass

Slab / membrane condition (is membrane clear of snow, standing water, debris or insulation): Can membrane be fully seen and photographed – ask contractor to remove an debris so membrane can be fully seen an inspected – this is a requirement of NHBC and local authorities.

Pass

External Wall Air bricks: Numbers, size. positions as design drawing? (Minimum of 3 walls)

Pass



Photo 49



Photo 50

Plot Inspection 4

12 / 12 (100%)

Plot Number

94

Type of Development: if other add Note

House

Floor Slab Type

Block and beam suspended

Are telescopic vents present?

Yes



Gas Membrane Type: Manufacturer, gauge, and colour. (Take photos were possible showing Label)

GP TITANFLEX

Installer's name, company and qualification

PRS

Gas Membrane Condition: Open punctures, tears, rips, stretching, Presence of debris, Repairs, Signs of weakness such as raised or sunken indentations, Protection plan in place to restrict access to lain gas membrane? IF FAIL DESCRIPTION IN ACTIONS AND PHOTOS REQUIRED

Pass

Are welds complete?

Yes

Are Joints lapped and sealed in accordance with manufacturer's requirements/ specification?

Yes

Service entries seals: Top hats seal arrangements fixed around service entries? Use of Jubilee clips or Bitumastic Sealant

Pass



Photo 51

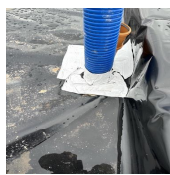


Photo 52

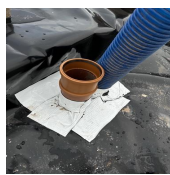


Photo 53



Photo 54



Photo 55

Corners / Internal joints: Check all corners are correctly formed or contractor has used preformed corners.

Pass



Photo 56



Photo 57



Photo 58



Photo 59



Photo 60



Photo 61



Photo 62



Photo 63



Photo 64



Photo 65



Photo 66



Photo 67

Are folds running in line with joints? (no joints cutting across folds)

Pass

Extent of Coverage: Is the membrane covering the entire plot? Does membrane span over outside walls?

Yes



Photo 68



Photo 69



Condition of sub-grade and underside of gas membrane: Check that the subgrade does not contain rough/uneven surfaces, is appropriately clean and that there are no hard/sharp objects. That protective sand blinding or geotextile (if specified) is present and meets the design criteria. (Lift back the membrane and photo the subfloor)	Pass
Slab / membrane condition (is membrane clear of snow, standing water, debris or insulation): Can membrane be fully seen and photographed – ask contractor to remove an debris so membrane can be fully seen an inspected – this is a requirement of NHBC and local authorities.	Pass
External Wall Air bricks: Numbers, size. positions as design drawing? (Minimum of 3 walls)	Pass
 Photo 70	
Plot Inspection 5	12 / 12 (100%)
Plot Number	98
Type of Development: if other add Note	House
Floor Slab Type	Block and beam suspended
Are telescopic vents present?	Yes
Gas Membrane Type: Manufacturer, gauge, and colour. (Take photos were possible showing Label)	GP TITANFLEX
Installer's name, company and qualification	PRS
Gas Membrane Condition: Open punctures, tears, rips, stretching, Presence of debris, Repairs, Signs of weakness such as raised or sunken indentations, Protection plan in place to restrict access to lain gas membrane? IF FAIL DESCRIPTION IN ACTIONS AND PHOTOS REQUIRED	Pass
Are welds complete?	Yes
Are Joints lapped and sealed in accordance with manufacturer's requirements/ specification?	Yes
Service entries seals: Top hats seal arrangements fixed around service entries? Use of Jubilee clips or Bitumastic Sealant	Pass



Photo 71



Photo 72

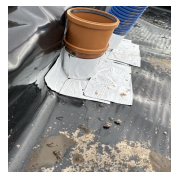


Photo 73



Photo 74



Photo 75



Photo 76

Corners / Internal joints: Check all corners are correctly formed or contractor has used preformed corners.

Pass



Photo 77



Photo 78



Photo 79



Photo 80



Photo 81



Photo 82



Photo 83



Photo 84



Photo 85



Photo 86

Are folds running in line with joints? (no joints cutting across folds)

Pass

Extent of Coverage: Is the membrane covering the entire plot?
Does membrane span over outside walls?

Yes



Photo 87



Photo 88

Condition of sub-grade and underside of gas membrane: Check that the subgrade does not contain rough/uneven surfaces, is appropriately clean and that there are no hard/sharp objects. That protective sand blinding or geotextile (if specified) is present and meets the design criteria. (Lift back the membrane and photo the subfloor)

Pass

Slab / membrane condition (is membrane clear of snow, standing water, debris or insulation): Can membrane be fully seen and photographed – ask contractor to remove an debris so membrane can be fully seen an inspected – this is a requirement of NHBC and local authorities.

Pass

External Wall Air bricks: Numbers, size. positions as design drawing? (Minimum of 3 walls)

Pass



Photo 89



Photo 90

Plot Inspection	6	12 / 12 (100%)
Plot Number	97	
Type of Development: if other add Note	House	
Floor Slab Type	Block and beam suspended	
Are telescopic vents present?	Yes	
Gas Membrane Type: Manufacturer, gauge, and colour. (Take photos where possible showing Label)	GP TITANFLEX	
Installer's name, company and qualification	PRS	
Gas Membrane Condition: Open punctures, tears, rips, stretching, Presence of debris, Repairs, Signs of weakness such as raised or sunken indentations, Protection plan in place to restrict access to laid gas membrane? IF FAIL DESCRIPTION IN ACTIONS AND PHOTOS REQUIRED	Pass	
Are welds complete?	Yes	
Are Joints lapped and sealed in accordance with manufacturer's requirements/ specification?	Yes	
Service entries seals: Top hats seal arrangements fixed around service entries? Use of Jubilee clips or Bitumastic Sealant	Pass	
Photo 91 Photo 92 Photo 93 Photo 94 Photo 95 Photo 96 Photo 97		
Corners / Internal joints: Check all corners are correctly formed or contractor has used preformed corners.	Pass	



Photo 98



Photo 99



Photo 100



Photo 101



Photo 102



Photo 103



Photo 104



Photo 105



Photo 106



Photo 107

Are folds running in line with joints? (no joints cutting across folds)

Pass

Extent of Coverage: Is the membrane covering the entire plot?
Does membrane span over outside walls?

Yes

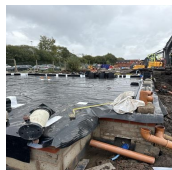


Photo 108



Photo 109

Condition of sub-grade and underside of gas membrane: Check that the subgrade does not contain rough/uneven surfaces, is appropriately clean and that there are no hard/sharp objects. That protective sand blinding or geotextile (if specified) is present and meets the design criteria. (Lift back the membrane and photo the subfloor)

Pass

Slab / membrane condition (is membrane clear of snow, standing water, debris or insulation): Can membrane be fully seen and photographed – ask contractor to remove an debris so membrane can be fully seen an inspected – this is a requirement of NHBC and local authorities.

Pass

External Wall Air bricks: Numbers, size. positions as design drawing? (Minimum of 3 walls)

Pass



Photo 110



Photo 111

Passive Venting

Sub-floor Void: Is a check possible on future plots (insert Plot number or NO in text box)

No



Media summary



Photo 1



Photo 2



Photo 3



Photo 4



Photo 5



Photo 6



Photo 7



Photo 8



Photo 9



Photo 10



Photo 11



Photo 12



Photo 13



Photo 14



Photo 15



Photo 16



Photo 17



Photo 18



Photo 19



Photo 20



Photo 21



Photo 22



Photo 23



Photo 24



Photo 25



Photo 26



Photo 27



Photo 28



Photo 29



Photo 30



Photo 31



Photo 32



Photo 33



Photo 34



Photo 35



Photo 36



Photo 37



Photo 38



Photo 39



Photo 40



Photo 41



Photo 42



Photo 43



Photo 44



Photo 45



Photo 46



Photo 47



Photo 48



Photo 49



Photo 50



Photo 51



Photo 52



Photo 53



Photo 54



Photo 55



Photo 56



Photo 57



Photo 58



Photo 59



Photo 60



Photo 61



Photo 62



Photo 63



Photo 64



Photo 65



Photo 66



Photo 67



Photo 68



Photo 69



Photo 70



Photo 71



Photo 72



Photo 73



Photo 74



Photo 75



Photo 76



Photo 77



Photo 78



Photo 79



Photo 80



Photo 81



Photo 82



Photo 83



Photo 84



Photo 85



Photo 86



Photo 87



Photo 88



Photo 89



Photo 90



Photo 91



Photo 92



Photo 93



Photo 94



Photo 95

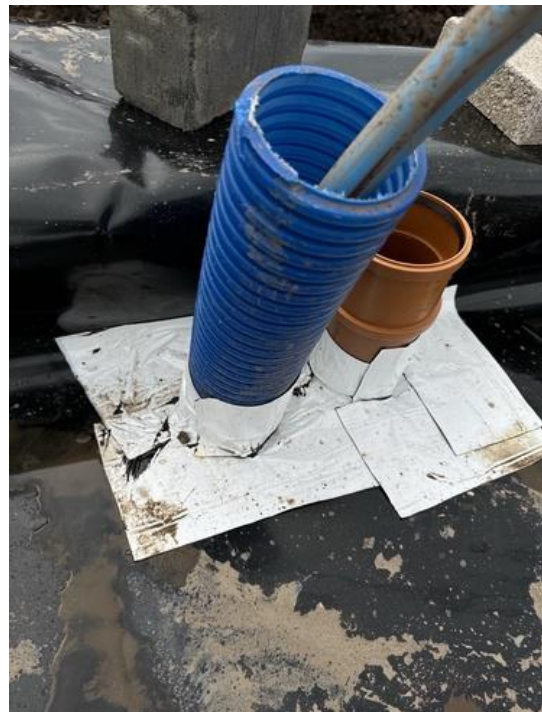


Photo 96



Photo 97



Photo 98



Photo 99



Photo 100



Photo 101



Photo 102



Photo 103



Photo 104



Photo 105



Photo 106



Photo 107



Photo 108



Photo 109



Photo 110



Photo 111



SUB-FLOOR VOID PHOTOS



Plot 101



Plot 102



Plot 103



Plot 104



Plot 101/102