

Date: 6th August 2024
Reference: 15-974 V9

GAS MEMBRANE VALIDATION – BENNETT STREET

Project Name:	Bennett Street
Project Number:	15-974
Client:	Kellen Homes
Date:	06-08-2024
Project Manager:	M. Dee
E3P Engineer:	M. Dee
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:	123 - 127

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 undertook subfloor void inspections for Plots 123-127 on the 31st July, 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 123 - 127 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.

A list of plots requiring validation and their associated validation letters is presented in Table 1.



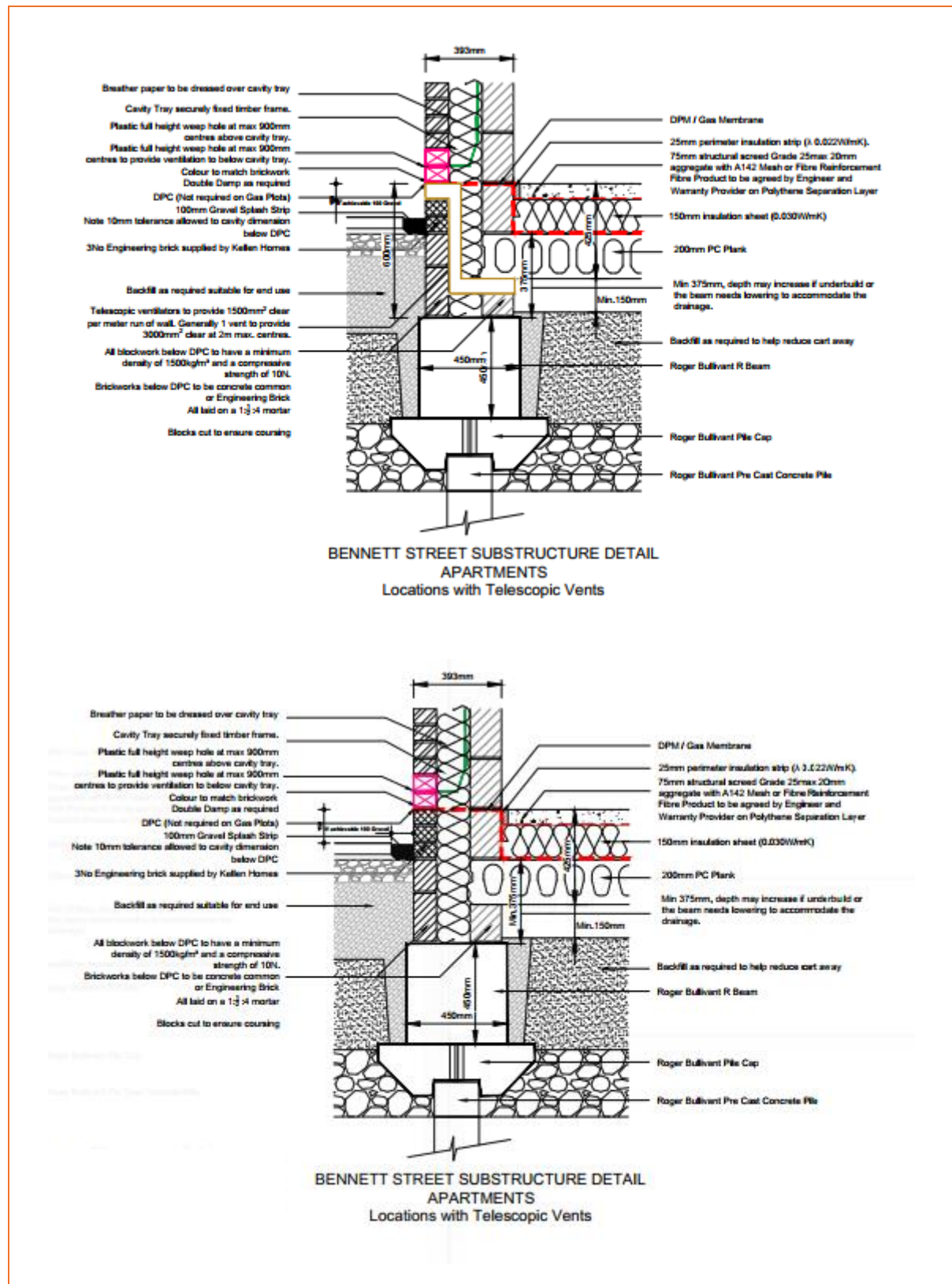


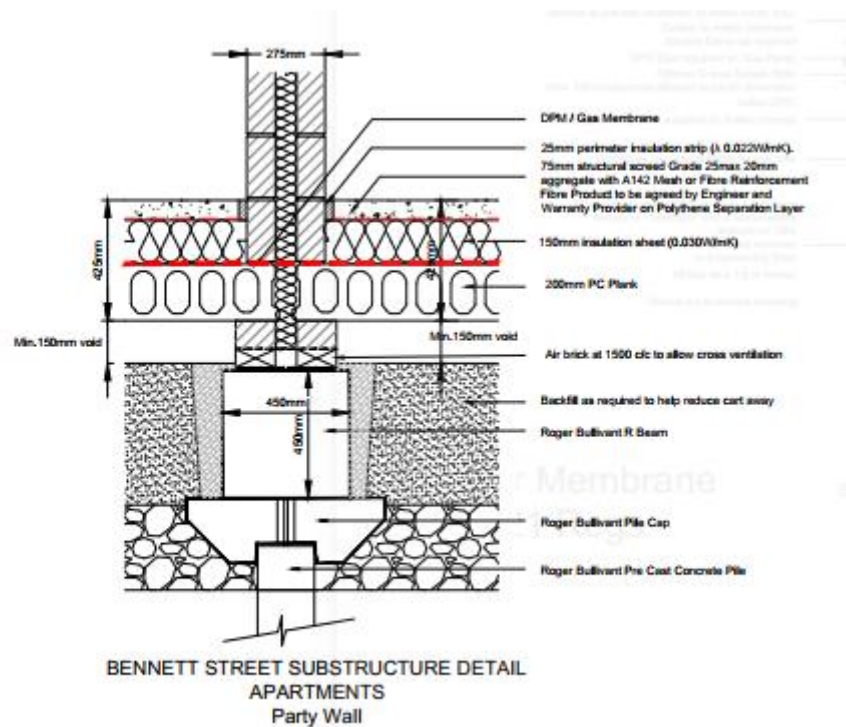
MEMBRANE SPECIFICATION: JUTA TITANFLEX (BLACK)

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

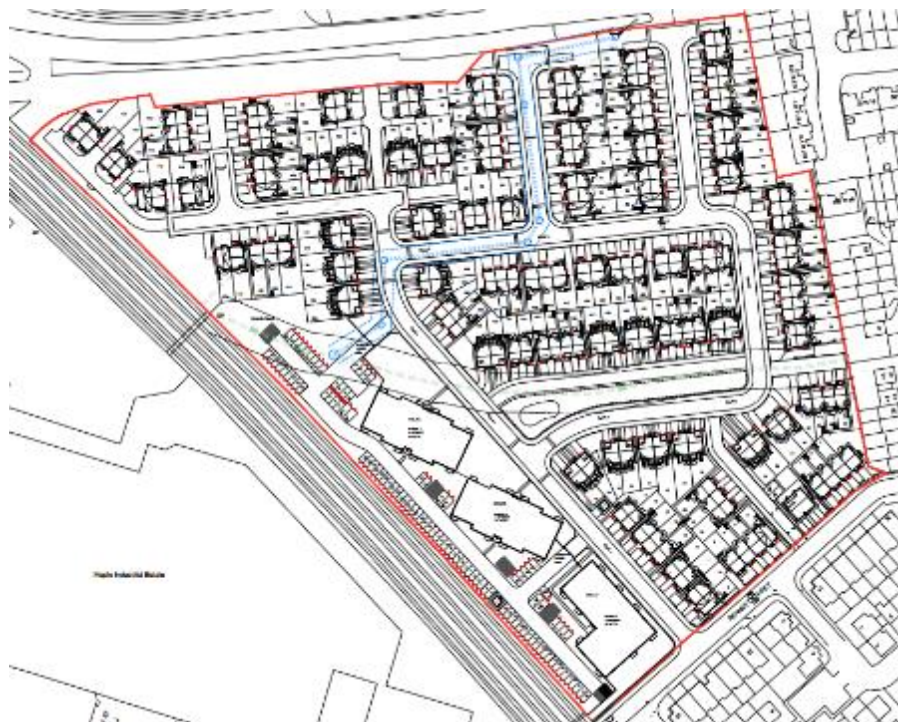


STRUCTURAL ENGINEER'S SUBSTRUCTURE DESIGN





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



WELDED GAS MEMBRANE VALIDATION

Complete

Score	37 / 37 (100%)	Flagged items	0	Actions	0
Site Name	Bennett Street				
Location	Bennett Street Manchester				
Project Manager	M. Dee				
Project number	15-974				
Developer	Kellen Homes				
Site representative Signature	M. Hudson 6 Aug 2024 3:05 PM BST				
Conducted on	6 Aug 2024 2:40 PM BST				
Prepared by	M. Dee				
Have you got the correct Gas Membrane detail (attached to the job in synergist)?	Yes				



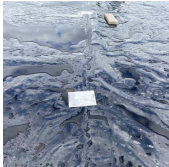
<u>Gas Membrane Inspection</u>	36 / 36 (100%)
<u>Plot Inspection</u>	36 / 36 (100%)
Plot Inspection 1	12 / 12 (100%)
Plot Number	123
Type of Development: if other add Note	House
Floor Slab Type	Block and beam suspended
Are telescopic vents present?	Yes
  Photo 1 Photo 2	
Gas Membrane Type: Manufacturer, gauge, and colour. (Take photos where possible showing Label)	Juta TitanFlex
Installer's name, company and qualification	JCW Gas Membranes Ltd, NVQ Level 2 – Installation of Gas Membranes in Construction
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
    Photo 3 Photo 4 Photo 5 Photo 6	
Are welds complete?	Yes
  Photo 7 Photo 8	
Are Joints lapped and sealed in accordance with manufacturer's requirements/ specification?	Yes



Photo 9



Photo 10



Photo 11



Photo 12

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

Pass

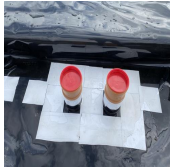


Photo 13



Photo 14



Photo 15



Photo 16

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

Pass



Photo 17



Photo 18



Photo 19



Photo 20

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 21



Photo 22



Photo 23



Photo 24

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



Photo 25

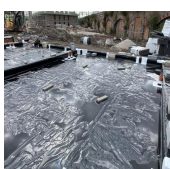


Photo 26

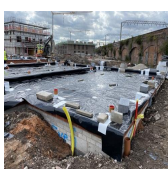


Photo 27



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



Photo 28



Photo 29



Photo 30



Photo 31



Photo 32

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

Pass



Photo 33

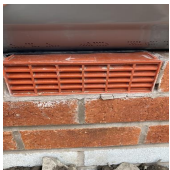


Photo 34



Photo 35

Plot Inspection 2

12 / 12 (100%)

Plot Number

124

Type of Development: if other add Note

House

Floor Slab Type

Block and beam suspended

Are telescopic vents present?

Yes



Photo 36



Photo 37

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

Juta TitanFlex

Installer's name, company and qualification

JCW Gas Membranes Ltd, NVQ
Level 2 – Installation of Gas
Membranes in Construction

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



Photo 38

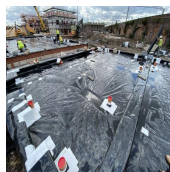


Photo 39



Photo 40



Photo 41



Photo 42

Are welds complete?

Yes



Photo 43



Photo 44

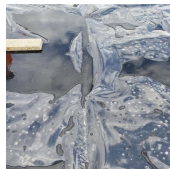


Photo 45



Photo 46



Photo 47

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

Yes



Photo 48



Photo 49



Photo 50



Photo 51



Photo 52

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

Pass



Photo 53

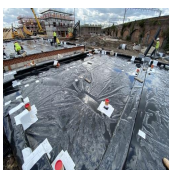


Photo 54



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

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 62



Photo 63



Photo 64



Photo 65

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



Photo 66



Photo 67



Photo 68



Photo 69



Photo 70



Photo 71

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



Photo 72



Photo 73



Photo 74



Photo 75

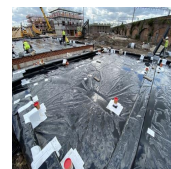


Photo 76

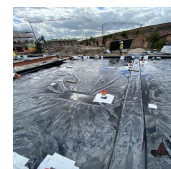


Photo 77

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

Pass



Photo 78



Photo 79

Plot Inspection 3

12 / 12 (100%)

Plot Number

125-127

Type of Development: if other add Note

House

Floor Slab Type

Block and beam suspended

Are telescopic vents present?

Yes



Photo 80



Photo 81



Photo 82



Photo 83



Photo 84



Photo 85

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

Juat TitanFlex

Installer's name, company and qualification

JCW Gas Membranes Ltd, NVQ
Level 2 – Installation of Gas
Membranes in Construction

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



Photo 86

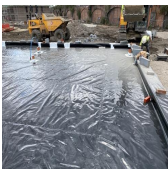


Photo 87



Photo 88



Photo 89



Photo 90



Photo 91

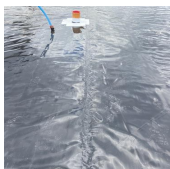


Photo 92

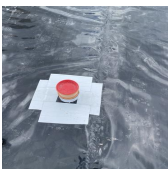


Photo 93



Photo 94



Photo 95

Are welds complete?

Yes



Photo 96



Photo 97



Photo 98

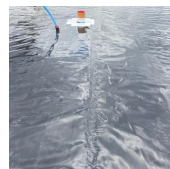


Photo 99

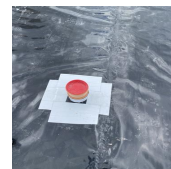


Photo 100



Photo 101

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

Yes

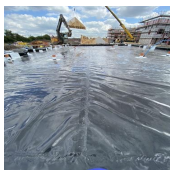


Photo 102



Photo 103

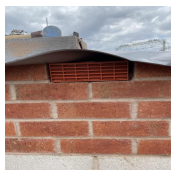


Photo 104



Photo 105



Photo 106

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

Pass



Photo 107



Photo 108

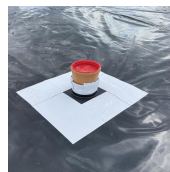


Photo 109



Photo 110

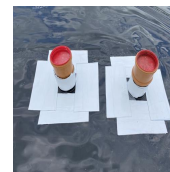


Photo 111



Photo 112

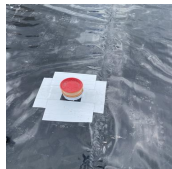


Photo 113



Photo 114

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

Pass



Photo 115



Photo 116



Photo 117



Photo 118



Photo 119

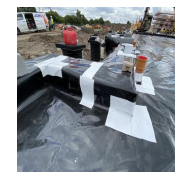


Photo 120

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 121



Photo 122



Photo 123



Photo 124



Photo 125

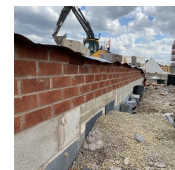


Photo 126



Photo 127

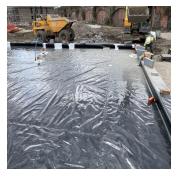


Photo 128

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



Photo 129



Photo 130

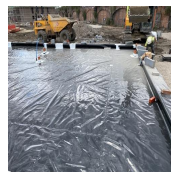


Photo 131



Photo 132



Photo 133

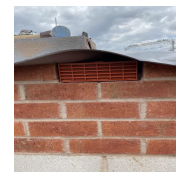


Photo 134

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



Photo 135

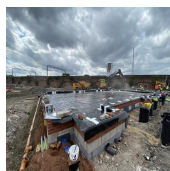


Photo 136



Photo 137



Photo 138



Photo 139



Photo 140

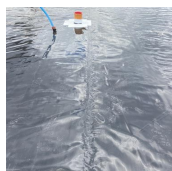


Photo 141



Photo 142

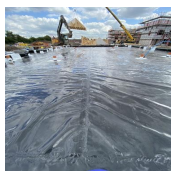


Photo 143



Photo 144

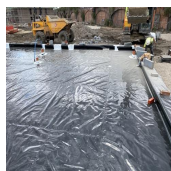


Photo 145

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

Pass



Photo 146



Photo 147

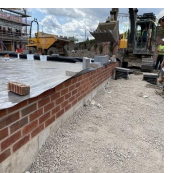


Photo 148



Photo 149

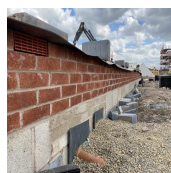


Photo 150

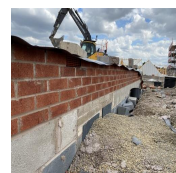


Photo 151



Photo 152

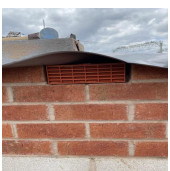


Photo 153

Passive Venting

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

Not during this visit - previously inspected plots 123-127 on 31st July - all plots show >150mm void space.



Photo 154



Photo 155



Photo 156



Photo 157



Photo 158



Photo 159



Photo 160



Photo 161



Photo 162



Photo 163



Photo 164



Photo 165



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



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Photo 71



Photo 72



Photo 73



Photo 74



Photo 75



Photo 76



Photo 77



Photo 78



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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

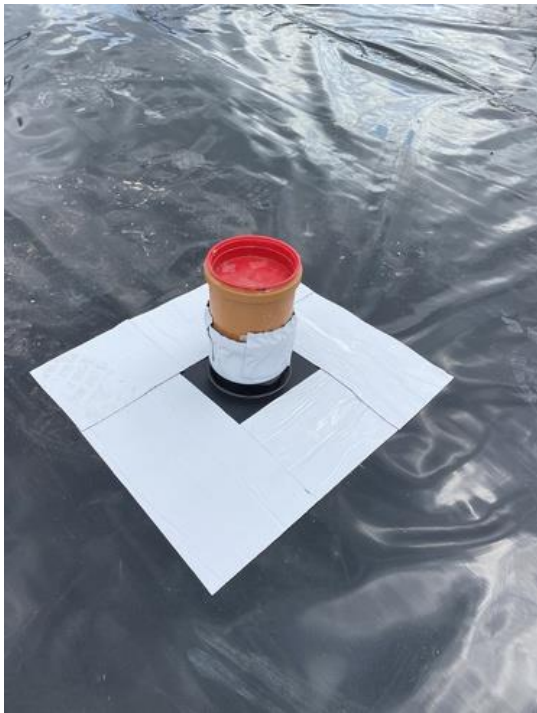


Photo 109



Photo 110

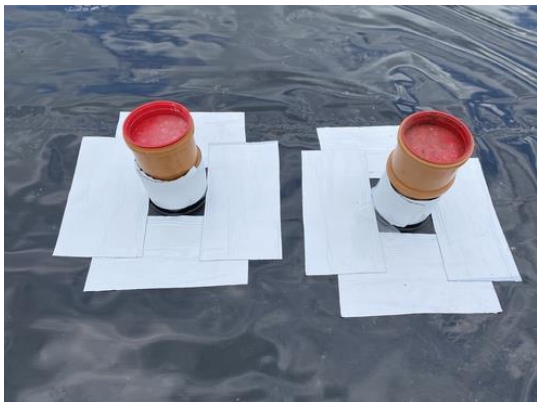


Photo 111



Photo 112



Photo 113



Photo 114



Photo 115



Photo 116



Photo 117



Photo 118



Photo 119



Photo 120



Photo 121



Photo 122



Photo 123



Photo 124



Photo 125



Photo 126



Photo 127



Photo 128



Photo 129



Photo 130



Photo 131



Photo 132



Photo 133



Photo 134



Photo 135



Photo 136



Photo 137



Photo 138



Photo 139



Photo 140



Photo 141



Photo 142



Photo 143



Photo 144



Photo 145



Photo 146



Photo 147



Photo 148



Photo 149



Photo 150



Photo 151



Photo 152



Photo 153



Photo 154



Photo 155



Photo 156



Photo 157



Photo 158



Photo 159



Photo 160



Photo 161



Photo 162



Photo 163



Photo 164



Photo 165