Date: 5th June 2024
Reference: 15-974 V7

GAS MEMBRANE VALIDATION – BENNETT STREET

Project Name:	Bennett Street
Project Number:	15-974
Client:	Kellen Homes
Date:	15-05-2024
Project Manager:	M. Dee
E3P Engineer:	J. Beer
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:	136-138 and 147-148

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 136 and Plot 137, 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 136-138 and 147-148 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

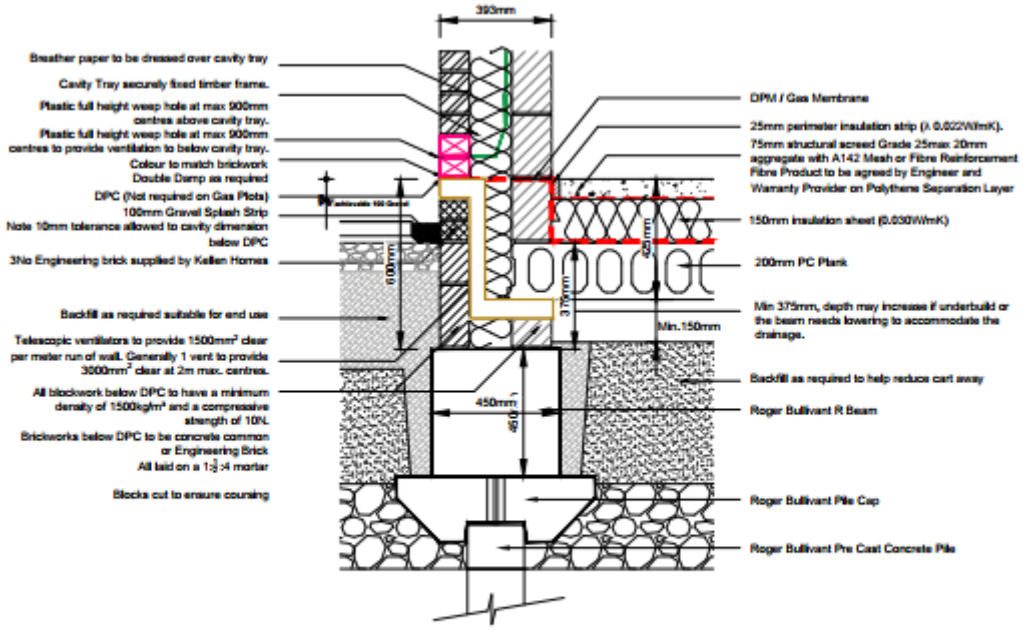
GP® TITANFLEX®

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/m²
Hydraulic Press	Water Vapour Transmission Rate	EN 1931	0.11 - 0.18 g/m²/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
	Resistance to Chemicals	EN 1296/EN 1928	Pass
Compliance and Certification	CE Mark - EN13967:2012		
	NHBC Standards Compliant		
	CIRIA C748 Compliant		
	BS 8485:2015 Compliant		
Vapour Permeability 100% Concentration	Transmission Rate of Benzene	EN ISO 15105-2	< 3.6 mg/m²/day
	Transmission Rate of Toluene	EN ISO 15105-2	< 13.8 mg/m²/day
	Transmission Rate of Ethyl Benzene	EN ISO 15105-2	< 2.7 mg/m²/day
	Transmission Rate of Xylenes (M,P,O)	EN ISO 15105-2	< 7.7 mg/m²/day
	Transmission Rate of Hexane	EN ISO 15105-2	< 0.6 mg/m²/day
	Transmission Rate of Vinyl Chloride	EN ISO 15105-2	< 0.05 mg/m²/day
	Transmission Rate of Trichloroethene (TCE)	EN ISO 15105-2	< 54.7 mg/m²/day
	Transmission Rate of Tetrachloroethene (PCE)	EN ISO 15105-2	< 26.2 mg/m²/day
	Transmission Rate of Naphthalene	EN ISO 15105-2	< 0.0006 mg/m²/day
	Transmission Rate of CIS-1,2-Dichloroethylene	EN ISO 15105-2	< 1.1 mg/m²/day
Gas Permeability	Methane Permeability	EN ISO 15105-1	0.13 ml/m²/day/atm
	Methane Permeability (Jointed)	EN ISO 15105-1	1.00 ml/m²/day/atm
	Carbon Dioxide Permeability	EN ISO 15105-1	3.01 ml/m²/day/atm
	Vinyl Chloride Gas Permeability	EN ISO 15105-1	0.04 ml/m²/day/atm
	Radon Permeability	K124/02/95	1.0 x 10^{-12} m²/S

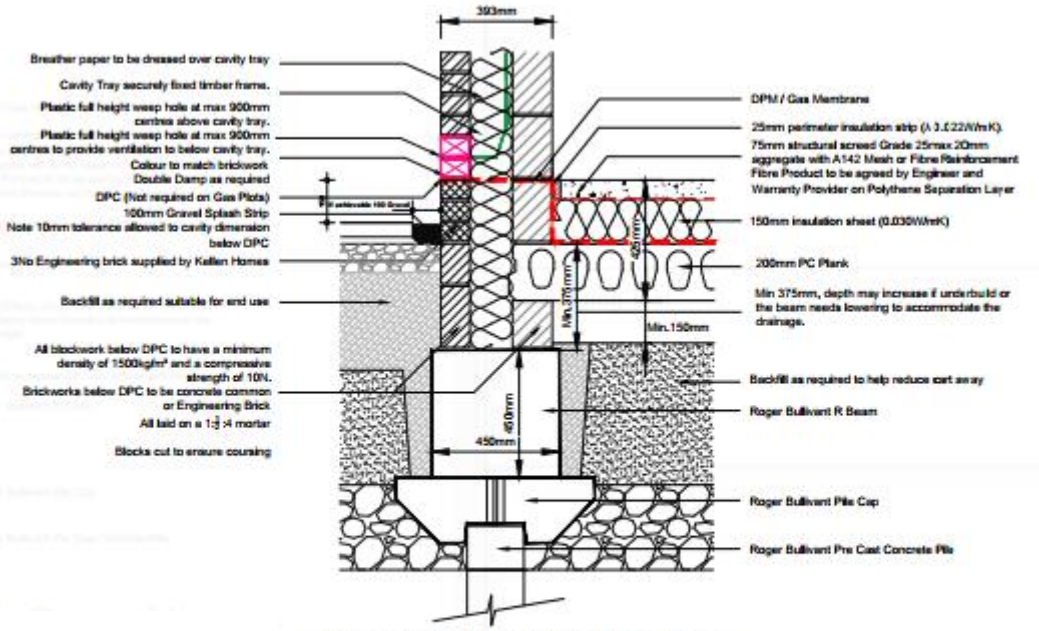
JUTA | TITANTECH

Juta.co.uk

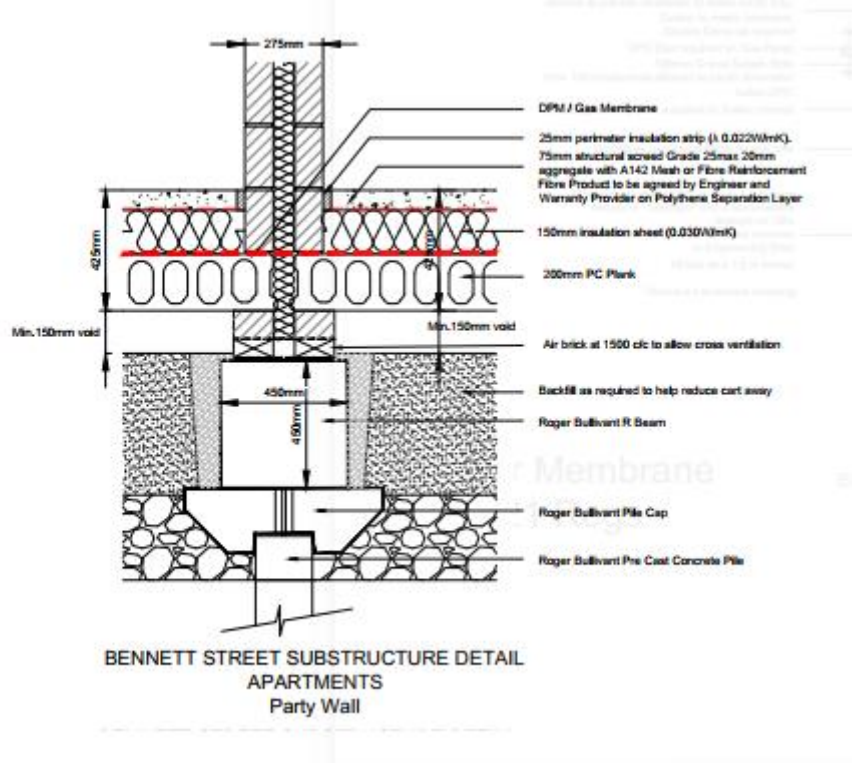
STRUCTURAL ENGINEER'S SUBSTRUCTURE DESIGN



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

WELDED GAS MEMBRANE VALIDATION

Complete

Score	25 / 25 (100%)	Flagged items	0	Actions	0

Site Name	Bennett street
Location	22 Galloway Dr Manchester England M12 United Kingdom (53.469126281022724, -2.2080975810035217)
Project Manager	Matt Dee
Project number	15-974
Developer	Kellen
Site representative Signature	[redacted] Wayne Green 15 May 2024 9:36 AM BST
Conducted on	15 May 2024 9:17 AM BST
Prepared by	Jonny Beer
Have you got the correct Gas Membrane detail (attached to the job in synergist)?	Yes

Gas Membrane Inspection	24 / 24 (100%)
Plot Inspection	24 / 24 (100%)
Plot Inspection 1	12 / 12 (100%)
Plot Number	147-148
Type of Development: if other add Note	House
Floor Slab Type	Block and beam suspended
Are telescopic vents present?	N/A
Gas Membrane Type: Manufacturer, gauge, and colour. (Take photos were possible showing Label)	Black
Installer's name, company and qualification	JCW
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 1

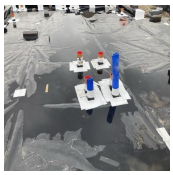

Photo 2


Photo 3


Photo 4


Photo 5


Photo 6

Are welds complete?	Yes


Photo 7


Photo 8


Photo 9


Photo 10

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


Photo 11


Photo 12

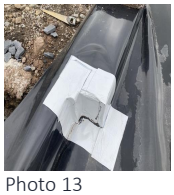

Photo 13


Photo 14


Photo 15


Photo 16


Photo 17


Photo 18


Photo 19


Photo 20


Photo 21


Photo 22


Photo 23

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


Photo 24


Photo 25


Photo 26


Photo 27


Photo 28

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


Photo 29


Photo 30


Photo 31


Photo 32

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 33


Photo 34


Photo 35


Photo 36


Photo 37

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 38

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 39


Photo 40

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


Photo 41


Photo 42


Photo 43

Plot Inspection 2	12 / 12 (100%)
Plot Number	136-138
Type of Development: if other add Note	House
Floor Slab Type	Block and beam suspended
Are telescopic vents present?	N/A
Gas Membrane Type: Manufacturer, gauge, and colour. (Take photos were possible showing Label)	Black
Installer's name, company and qualification	JCW
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

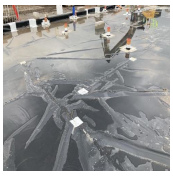

Photo 44


Photo 45


Photo 46


Photo 47

Are welds complete? Yes


Photo 48


Photo 49

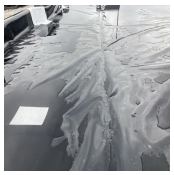

Photo 50


Photo 51

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


Photo 52


Photo 53


Photo 54


Photo 55

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


Photo 56


Photo 57


Photo 58


Photo 59

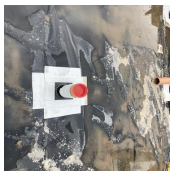

Photo 60


Photo 61


Photo 62


Photo 63


Photo 64


Photo 65


Photo 66


Photo 67

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

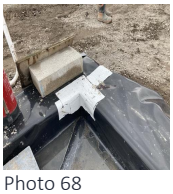

Photo 68


Photo 69


Photo 70


Photo 71


Photo 72

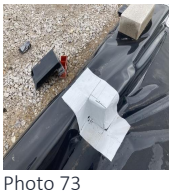

Photo 73


Photo 74


Photo 75


Photo 76

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 77

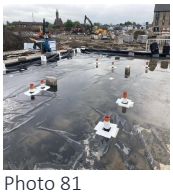

Photo 78

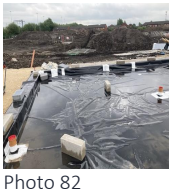

Photo 79

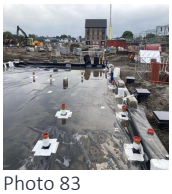
Condition of sub-grade and underside of gas membrane: Check that the subgrade does not contain rough/uneven surfaces, is appropriately clean and that there are no hard/sharp objects. That protective sand blinding or geotextile (if specified) is present and meets the design criteria. (Lift back the membrane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


Photo 80

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 81


Photo 82


Photo 83

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


Photo 84


Photo 85


Photo 86

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

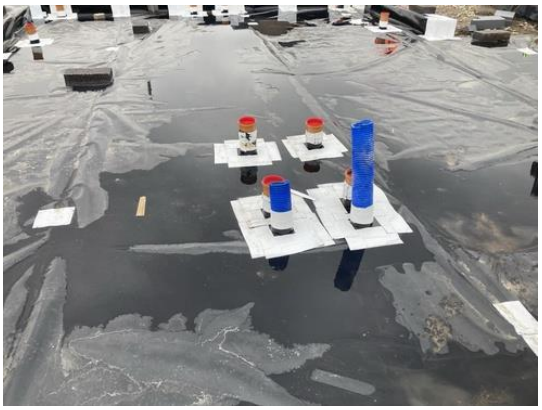


Photo 2



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

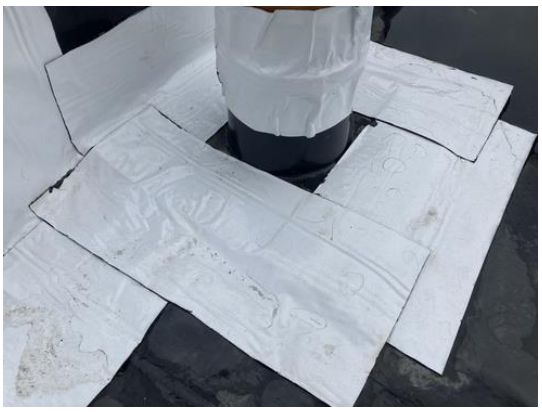


Photo 27



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

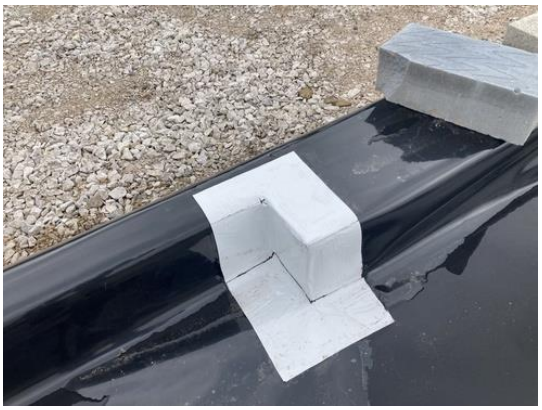


Photo 71



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

Floor Void Inspection

23 Apr 2024 / Joe Newall

Complete

Score	4 / 4 (100%)
Site Name	Bennet street
Project Number	15974
Conducted on	23 Apr 2024 11:38 AM BST
Prepared by	Joe Newall
Location	25 Brick Kiln Road Manchester England M12 United Kingdom (53.46963405369651, -2.211042753506421)
Plot Inspection	4 / 4 (100%)
Plot Inspection 1	2 / 2 (100%)
Plot Number	137
Is the void clear?	Yes


Photo 1


Photo 2


Photo 3


Photo 4

Depth of Void	300
Are Sleeper Walls Vented?	Yes


Photo 5


Photo 6


Photo 7

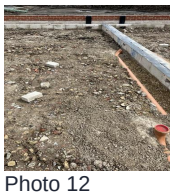

Photo 8


Photo 9

Plot Inspection 2	2 / 2 (100%)
Plot Number	136
Is the void clear?	Yes


Photo 10


Photo 11


Photo 12

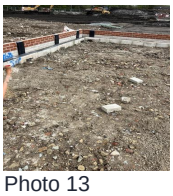
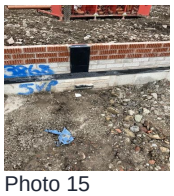

Photo 13


Photo 14


Photo 15

Depth of Void	300
Are Sleeper Walls Vented?	Yes


Photo 16


Photo 17


Photo 18


Photo 19


Photo 20

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