Assessment of: Polyurea WHE110

AS 4654.1:2012

Waterproofing membranes for external above-ground use Part 1: Materials

Client

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Report number: SW8555 (Ist revalidation of CSIRO report 8416)

CSIRO Job No.: SW8555
Date of issue: 23/05/2025

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The results reported herein relate only to the item(s) tested.

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Summary

Test Standard: Testing was conducted on a waterproofing membrane for external above-ground use with fully bonded membrane liquid non-exposed to assess its performance for: water vapour transmission; acceptance of cycle movement; durability; bond strength and thickness. The external waterproofing membranes properties were tested in accordance with the Australian Standard AS4654.1:2012.

All methods were carried out according to Tables 2.1 under fully bonded membrane liquid non-exposed against the performance criteria of Tables A1, A3 and A4.

Test results: The waterproofing membrane presented for testing complied with the performance criteria set in AS4654.1:2012 waterproofing membrane for external above-ground, non-exposed. The following table shows the Polyurea WHE110 performance as assessed from testing.

TABLE 1 SUMMARY OF TEST REQUIREMENTS AND TEST SPECIMEN RESULTS FOR AS4654.1:2012

TEST	METHOD	REQUIREMENTS	RESULT
(a) Moisture Transmission Rate	ASTM E 96 Desiccant method for Determining Water Vapour Transmission (WVT)	Record result	WVT 10.25 g/m^2/24hrs Permeance 70.39 ng/Pa.s.m^2
(b) Acceptance of movement	AS AS4654.1 Appendix B for assessment of cyclic movement of membrane	Pass or fail criteria by observing any cracking, rupture holing or extending through the thickness for more than 1 mm in from the edge of the specimen.	Class III Complied
(c) Durability **1. Control** **2. Control 1st revalidation** **3. Water immersion** **4. Detergent immersion** **5. Heat ageing at 80°C** **6. Temperature resistance at -15°C to +85°C**	AS4654.1 Appendix A for assessment of membranes durability AS4654.2 temperature resistance section 2.4.2 (c)	Pass or fail criteria; compared to control samples: elongation at break shall be not less than 25 % for water and detergent immersion. Whereas elongation at break shall be not less than 50 % for heat ageing samples.	1. Class III 2. Class III 3. Complied 4. Complied 5. Complied 6. Complied
(d) Bond strength to concrete substrate	ASTM C794 Standard test method for adhesion-in-peel of elastomeric joint sealants	Test samples exposed to dry conditions, then tested for adhesion-in-peel strength.	161.47 N with 100% adhesive failure loss for concrete.
(e) Membrane thickness	AS/NZS 4347.9:1995 (Reconfirmed) 2014 Damp-proof courses and flashings.	The film thickness shall be measured at a minimum of five points and a maximum of 10 points, equally spaced across the strip	1.49 mm

Note: The above is only a summary of the overall results and must be read in conjunction with the relevant sections of this report.

SUMMARY OF RESULTS

AS 4654.1:2012 Waterproofing membranes for external above-ground use, non-exposed:

Appendix A: Assessment of Durability of waterproof membranes

Test Report No.	**8416**	**SW8555 (1st Revalidation)**	
Year of test	2022	2025	
Control	337%	355%	**(Class III)**
Water Immersion@56d	344%		PASS
Detergent Immersion@56d	341%		PASS
Heat Ageing @ 80 ºC	314%		PASS
Temperature Resistance	322% @-15°C		PASS
	311% @+85°C		PASS

Parchem Construction Supplies, test sample, the Fosroc Polyurea WHE110 - Waterproofing Membrane achieves the performance requirements of AS 4654.1:2012 Waterproofing membranes for external above-ground use, Non-exposed, Class III membrane installation.

Appendix B: Assessment of resistance of waterproofing membranes to cyclic movement

Pass or Fail criteria by observing any cracking, rupture holing or extending through the thickness for more than 1 mm in from the edge of the specimen.

Result:	No fatigue cracking exhibited.	PASS

ASTM E96: Water Vapour Transmission of Materials

Result	10.25 g/m²/24	PASS
AS 4347.9:2002	Thickness	1.49mm

ASTM C794	Bond Strength – Concrete Substrate, Dry Condition	161.47N,

Introduction

CSIRO Services was engaged to assess a waterproofing membrane for compliance against the AS4654.1:2012 according to Table 2.1 under fully bonded membrane liquid, non-exposed with compliance confirmed against the performance criteria of Tables A1, A3 and A4. The details for this assessment are listed in Table 3 below.

TABLE 2 DETAILS OF SUBMITTED TEST SPECIMEN

CSIRO Agreement No.:	SW8555
TEST SPONSOR:	Parchem Construction Supplies Pty Ltd
PRODUCT DESCRIPTION:	Fosroc Polyurea WHE110
SPECIMEN RECEIVED DATE:	14/05/2025

Note: CSIRO accepts no responsibility for the selection of specimens. The results in this report apply to the specimens tested and may not be applicable to other specimens of the same product.

This report details the performance, testing conditions and outcomes of the specimen assessed in accordance with waterproofing membrane system for exterior use - above ground level. Table 3 details the sponsor's specified schedule of tests for the product.

TABLE 3 DETAILS OF THE SCHEDULE FOR TESTING OF THE SUBMITTED SPECIMEN

CSIRO Agreement No.:	SW8555
TEST SCHEDULE:	AS4654.1 Clause A2, A4 Tables A1, A3 & A4: a) Moisture vapour transmission rate - ASTM Designation E96/E96M – 16, 'Standard Test Methods for Water Vapour Transmission'; b) Acceptance of cyclic movement; Appendix B 'Assessment of resistance of waterproofing membranes to cyclic movement'; c) Durability - Appendix A 'Assessment of durability of waterproofing membranes: Table A4 (a) Controls Controls 1st revalidation Table A4 (b) Water immersion Table A4 (c) Detergent immersion Table A1 & A4 (d) Heat aging at 80°C d) Temperature resistance at -15°C to +85°C e) Bond strength to concrete substrate - ASTM C794:2018 Standard test method for adhesion-in-peel of elastomeric joint sealants. f) Membrane thickness – AS/NZS 4347.9:1995 (Reconfirmed) 2014 Damp-proof courses and flashings.

Test specimen description

The Fosroc Polyurea WHE110 supplied by Parchem Construction Supplies Pty Ltd is a spray-applied, 100% solids, flexible, two-component, rapid curing pure Polyurea system, designed as a waterproofing and protective coating. The nominal size of the membrane was 500 mm wide, 500 mm length and 1.55 mm thick.

The supplied specimen for assessment is shown below in Figures 1 and 2.

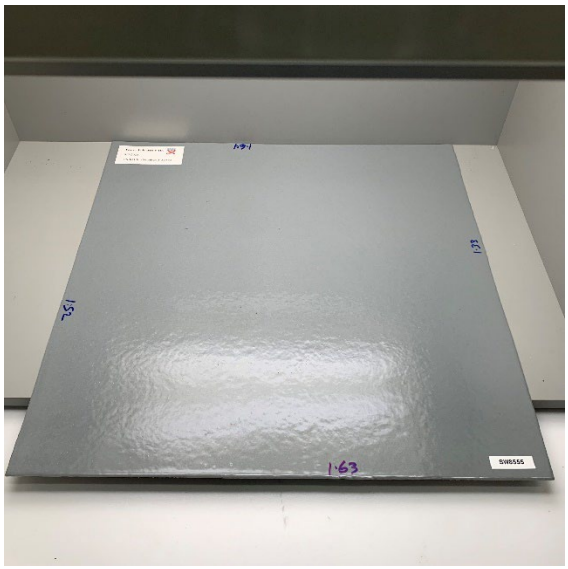


FIGURE 1 TOP FACE OF POLYUREA WHE110

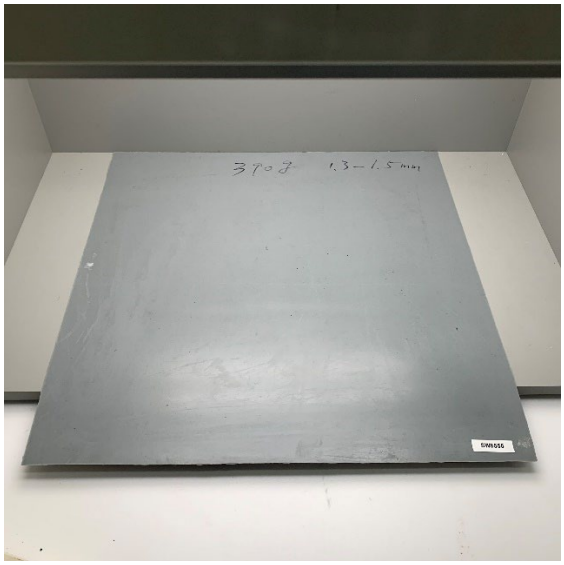


FIGURE 2 UNDERSIDE OF POLYUREA WHE110

Test Methodology

ASTM E96/E96M – 16 Water Vapour Transmission of materials

This Standard outlines the method for determining water vapour transmission (WVT) through the membrane using the desiccant and dummy sample method.

Four test samples were prepared by mechanical sealed using two neoprenes and a Teflon gasket placed onto the open side of the test cups. The test cups contain dried desiccant with the trafficable side facing up were placed in a climate-controlled environment with periodic weighing so that the rate of water vapour movement through the membrane to the desiccant can be determined.

The exposed area (test dish face) for each of the cups was 0.002827 m^2. The test cups (all except the dummy sample, no desiccant) had a 6 mm gap between the desiccant and the underside of the membrane.

All test assemblies were kept in a Steridium environmental where chamber temperature humidity are maintained at a temperature of 23 ±2^oC and 60 ±5% relative humidity, for the 43 days duration. Measurements taken each afternoon (excluding weekends) over this period to determine the weight change and permeance of the membrane.

AS4654.1-2012 Appendix B Resistance to cyclic movement

This Standard outlines the method for determining resistance of membrane to cyclic movement set at maximum strain used for the cycling shall be 4mm of extension.

A rectangular test sample of 65 mm x 25 mm x 1.58 mm was cut from the Polyurea WHE110, then held in the test grips (70(w) x 45(l) x 20(t) mm), exposing a 25 x 2 mm central portion of the sample.

An Applied Test Systems Series 904 Vertical Sealant Tester was used for testing. The vertical sealant testing machine used software for cyclic movement control. The vertical testing machine was set to elongate the clamped test sample for the cycling is 4 mm extension. Once the test piece reached full extension, it then returned to its original position, which completed one cycle of movement. The elongation and return was then repeated to complete a 50 cycle movement test, each cycle conducted over a nominal 2 hour period.

The test sample was inspected for signs of breakage or cracks and measured for any necking. A reduction in width of more than 1 mm inwards from the edge of the test sample constitutes a failure.

AS 4654.1-2012 Appendix A Durability of membrane and Temperature Resistance

This Standard outlines the method for determining resistance of the membrane's durability after conditioning in various solutions over set periods, then assessed against an unconditioned material.

Testing of the Polyurea WHE110 was in accordance with Appendix A4.2 Durability of membranes. As specified in A2.2.1 the membrane test samples were prepared in accordance with AS 1145.3-2001, Type 2, strip samples 10mm width with a 50mm gauge length. Test samples were exposed and conditioned to those requirements specified in Table A1, A4 & Temperature Resistance of AS4654.1-2012.

In accordance with A4.2.2.2 Testing, a universal testing machine, fitted with a calibrated 5kN load cell, was used to record the elongation at break and tensile strength. The test rate of 300 mm/min used for testing elongation at break of the immersed test samples were compared to the control test samples.

ASTM C794:2018 Standard test method for adhesion-in-peel of elastomeric joint sealants

This test method consists of preparing four strip test specimens of 25mm width and 250mm in length by embedding a wire mesh screen between two thin layers of Polyurea WHE110 on to the surface of concrete substrate. All adhesion-in-peel test specimens were prepared by the manufacturer per ASTM C794:2018 procedure. After delivered to the laboratory, all test specimens were kept in a conditioning room maintained at a temperature of 23 ±2^{o}C and 60 ±5% relative humidity, for the 21 days duration. Then the specimens were placed in a tension-testing machine in such a way the test sample is peeled back from the substrates at 180° to the face of the sample. The exerted force was measured as well as the mode of failure of the membrane from both substrates at the test rate of 50mm/min for 1 minute.

AS/NZS 4347.9:1995 (Reconfirmed) 2014 Damp-proof courses and flashings—Methods of test, Method 9: Determining thickness

This Standard sets out a means to determining the thickness of polyethylene film. All three rectangular test strips of 290 mm x 50 mm was cut across middle width of supplied sheets. The sheet thickness measured a three points, equally spaced across the strip. The specimens were tested in a conditioning room maintained at a temperature of 23 ±2^{o}C and 60 ±5% relative humidity.

Results

ATSM E96/E96M - 16 Water Vapour Transmission of materials

The periodic measurements of the membrane test samples were recorded as shown in Table 4, below.

	In	Out
Date of Preconditioning:	26/10/2021	2/11/2021
Date of test:	3/12/2021	16/12/2021

TABLE 4 WATER VAPOUR TRANSMISSION TEST RESULTS

Specimens No.	Water Vapour Transmission (g/m2 24hr)	Permeance (ng/Pa.s.m^2)
8416/57	9.44	64.83
8416/58	11.10	76.22
8416/59	10.21	70.13
Average	**10.25**	**70.39**

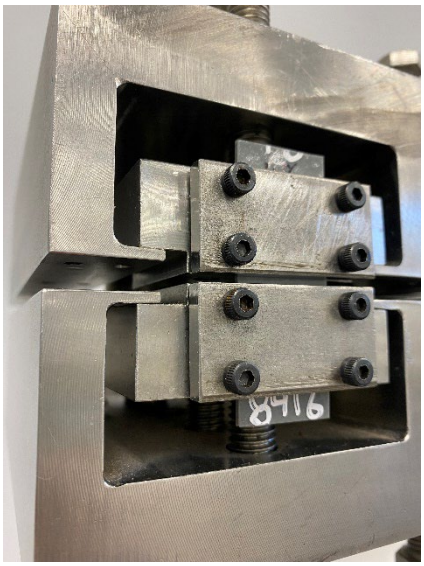
The performance criteria set out in AS4654.1 – 2012, Table A3 to record result, specifies a water vapour transmission rate shall determine if material is a moisture suppressant coating.

AS 4654.1:2012 Appendix B Resistance of waterproofing membranes to cyclic movement

The test result for cyclic movement of the waterproofing membrane test sample is shown in Table 5 below. The test sample completed 50 cycles for the nominal 2 hour period.

	In	Out
Date of Preconditioning:	12/01/2022	19/01/2022
Date of test:	19/01/2022	23/01/2022

TABLE 5 TEST SAMPLE HOLING DURING CYCLIC MOVEMENT AND TEST RESULTS

Specimen No.:	8416/48	
Test specimen	Test specimen 65 (l) mm x 25 (w) mm x 1.58 (t) mm section	
Membrane Classification	CLASS III	
Elongation at break:	Maximum strain used for the cycling shall be 4mm of extension	
Clamped test specimen of cyclic test:		
Observations		
Day 1	Not Detected	
Day 2	Not Detected	
Day 3	Not Detected	
Day 4	Not Detected	
Surface Defects		
Crazing	Not Detected	
Surface Tear	Not Detected	
Membrane Rupture	Not Detected	
Final Result	PASS	50 cycles

The performance criteria set out in AS4654.1:2012, Table A3 and section B4, pass or fail criteria by observing any cracking, rupture or necking of more than 1 mm down from original width.

AS 4654.1:2012 Appendix A Durability of membrane

The tensile strength and elongation at break were recorded for the control and immersed test samples. Criteria for pass or failure of the immersed test samples were then compared to the control samples. AS 4654.1:2012 Table A2 joint movement bond breaker was also referenced in Table 6, below.

	In	Out
Date of Preconditioning:	26/10/2021	3/11/2021
Date of test:	3/11/2021	3/11/2021

TABLE 6 DURABILITY TEST RESULTS - CONTROL

Control Specimens						
For the 1st Revalidation SW8555 22/05/2025	Break Force (N)	Thickness (mm)	Tensile strength (F/A) (MPa)	Elongation at break (mm)	(%)	Class
SW8588 / 01	249.79	1.56	16.01	178.29 & 356.58		III
SW8588 / 02	270.23	1.55	17.43	185.06 & 370.12		
SW8588 / 03	276.26	1.57	17.60	187.75 & 375.49		
SW8588 / 04	244.04	1.54	15.85	174.00 & 347.99		
SW8588 / 05	209.26	1.55	13.50	162.50 & 325.00		
Average	**249.92**	**1.55**	**16.08**	**177.52 & 355.00**		
For the Main Job:4816	Break Force (N)	Thickness (mm)	Tensile strength (F/A) (MPa)	Elongation at break (mm)	(%)	Class
8416/01	209.09	1.59	13.15	150.07	300	III
8416/02	247.40	1.58	15.66	181.87	364	
8416/03	255.20	1.59	16.05	180.60	361	
8416/04	222.52	1.58	14.08	159.00	318	
8416/05	229.17	1.57	14.60	170.85	342	
Average	232.68	1.58	14.71	168.48	337	

Table A1: Classification of Membranes
CLASS I – Elongation at break <60%
CLASS II – Elongation at break 60-299%
CLASS III – Elongation at break ≥300%
Class III membrane, a 12mm wide bond breaker/tape should be applied over a joint to accommodate the joint opening by up to 5 mm.

Water Immersion

	In	Out
Date of Preconditioning (7D):	27/10/2021	3/11/2021
Date in Water (7D):	3/11/2021	10/11/2021
Date of Test (7D):	10/11/2021	-
Date of Preconditioning (28D):	27/10/2021	3/11/2021
Date in Water (28D):	3/11/2021	1/12/2021
Date of Test (28D):	1/12/2021	-
Date of Preconditioning (56D):	27/10/2021	3/11/2021
Date in Water (56D):	3/11/2021	29/12/2021
Date of Test (56D):	29/12/2021	-

TABLE 7 DURABILITY TEST RESULTS – WATER IMMERSION

Water Immersion Specimens						
	Average Break Force (N)	Average Thickness (mm)	Average Tensile strength (F/A) (MPa)	Average Elongation at break		PASS/FAIL
				(mm)	(%)	
7 day period	177.77	1.54	11.56	161.00	322	PASS
28 day period	176.45	1.47	12.02	166.88	334	PASS
56 day period	190.42	1.50	12.71	171.94	344	PASS
Observations:						
7 day period	No defect					
28 day period	No defect					
56 day period	Ne defect					
Table A4: Pass / Fail and Criteria compared with control samples PASS – Elongation at break shall not be less than 25% retention of elongation at break of the controls						

Detergent Immersion

	In	Out
Date of Preconditioning (7D):	27/10/2021	3/11/2021
Date in Water (7D):	3/11/2021	10/11/2021
Date of Test (7D):	10/11/2021	-
Date of Preconditioning (28D):	27/10/2021	3/11/2021
Date in Water (28D):	3/11/2021	1/12/2021
Date of Test (28D):	1/12/2021	-
Date of Preconditioning (56D):	27/10/2021	3/11/2021
Date in Water (56D):	3/11/2021	29/12/2021
Date of Test (56D):	29/12/2021	-

TABLE 8 DURABILITY TEST RESULTS – DETERGENT IMMERSION

Detergent Immersion Specimens						
	Average Break Force (N)	Average Thickness (mm)	Average Tensile strength (F/A) (MPa)	Average Elongation at break		PASS/FAIL
				(mm)	(%)	
7 day period	165.19	1.48	11.18	155.74	311	PASS
28 day period	158.30	1.48	10.74	153.13	306	PASS
56 day period	182.21	1.47	12.43	170.27	341	PASS
Observations:						
7 day period	No defect					
28 day period	No defect					
56 day period	Ne defect					
Table A4: Pass / Fail and Criteria compared with control samples PASS – Elongation at break shall not be less than 25% retention of elongation at break of the controls						

Heat Ageing

	In	Out
Date of Preconditioning:	27/10/2021	3/11/2021
Date in Oven:	3/11/2021	17/11/2021
Date of Test:	19/11/2021	-

TABLE 9 DURABILITY TEST RESULTS – HEAT AGEING

Heat Ageing @80 °C						
	Average Break Force (N)	Average Thickness (mm)	Average Tensile strength (F/A) (MPa)	Average Elongation at break		PASS/FAIL
				(mm)	(%)	
14 day period	243.08	1.55	15	156.99	314	PASS
Observations: No defect Table A4: Pass / Fail and Criteria compared with control samples PASS – Elongation at break shall not be less than 50% retention of elongation at break of the controls						

Temperature Resistance

	In	Out
Date of Preconditioning:	26/10/2021	2/11/2021
Date in Oven (85°C):	3/11/2021	10/11/2021
Date of Test:	12/11/2021	-
Date of Preconditioning:	26/10/2021	2/11/2021
Date in Freezer (-15°C):	3/11/2021	10/11/2021
Date of Test:	12/11/2021	-

TABLE 10 DURABILITY TEST RESULTS - TEMPERATURE RESISTANCE

Temperature Resistance Specimens						
	Average Break Force (N)	Average Thickness (mm)	Average Tensile strength (F/A) (MPa)	Average Elongation at break		PASS/FAIL
				(mm)	(%)	
7 day period @ 85°C	205.12	1.44	14.31	155.25	311	PASS
7 day period @ -15°C	223.74	1.46	15.36	160.86	322	PASS
Observations: No defect Table A4: Pass / Fail and Criteria compared with control samples PASS – Elongation at break shall not be less than 50% retention of elongation at break of the controls						

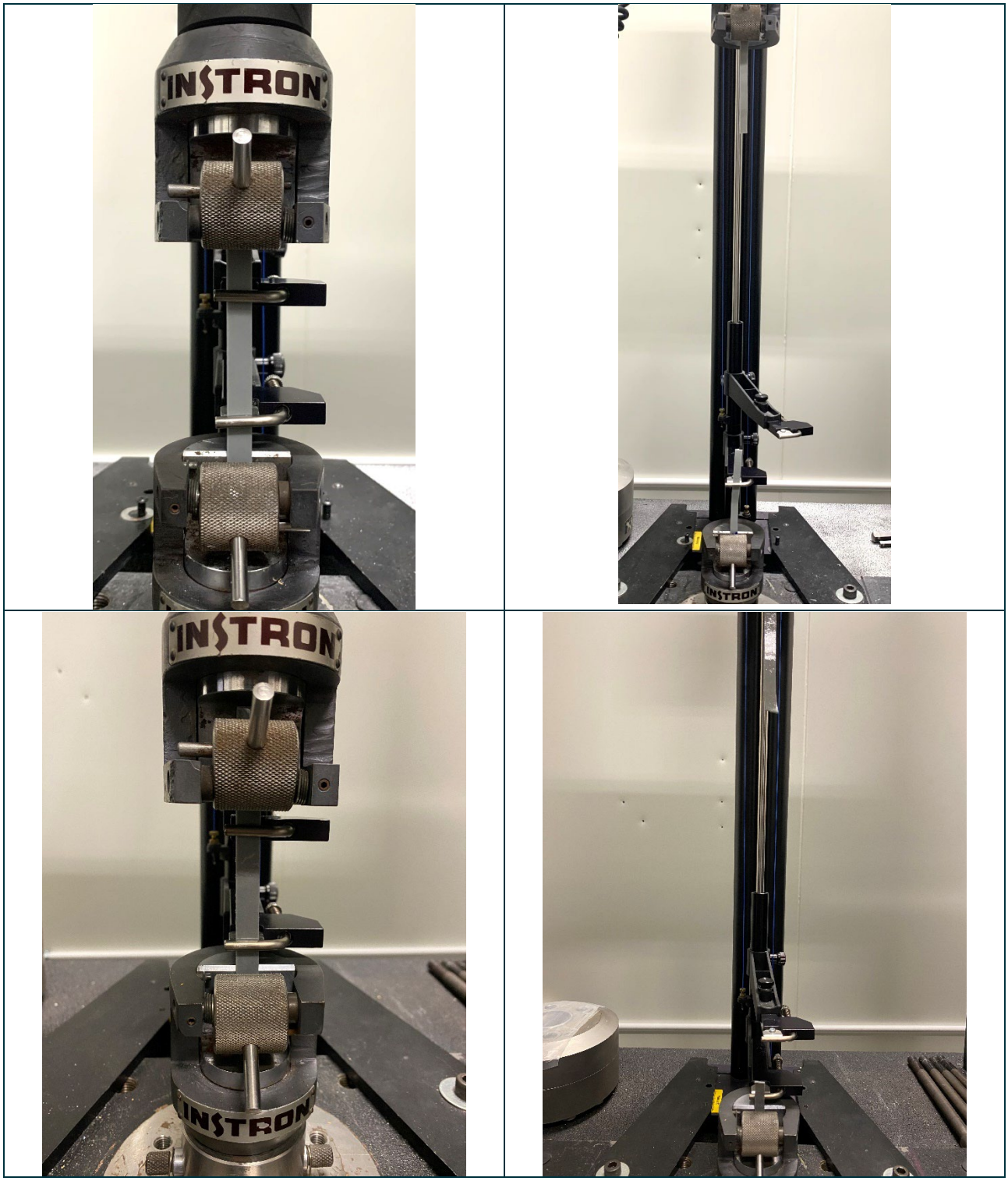


FIGURE 3 IMAGES OF TEST SAMPLE PERFORMING DURABILITY LOAD / ELONGATION TEST

ASTM C794:2018 Standard test method for adhesion-in-peel of elastomeric joint sealants

Results reproduced from base variant product, reference report 8372

The measured dimensions of the test samples placed in the test rig stand are shown in Table 7, below.

	In	Out
Date of Preconditioning:	10/05/2021	31/05/2021
Date of test:	31/05/2021	31/05/2021

TABLE 11 ADHESION-IN-PEEL STRENGTH TEST RESULTS

Concrete Substrate				
Specimen No.	Length and width of Tes Specimen (mm)	Peel Adhesion Strength in Dry Conditions (N)	Adhesive Loss (%)	Failure Type
8372/52 8372/53 8372/54 8372/55	100x25 100x25 100x25 100x25	197.44 215.31 69.69 163.42	100 100 100 100	Adhesive Failure Adhesive Failure Adhesive Failure Adhesive Failure
	Mean	**161.47**	**100**	

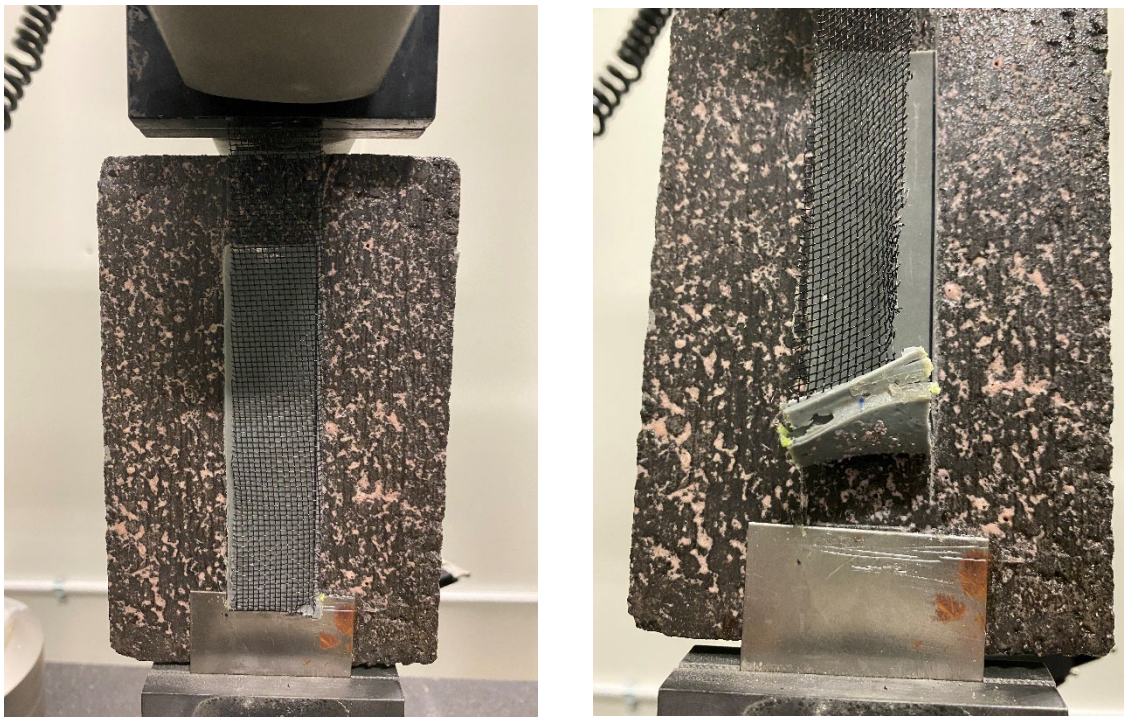


FIGURE 4 IMAGES OF TEST SAMPLE PERFORMING ADHESION-IN-PEEL

AS/NZS 4347.9:1995 (Reconfirmed) 2014 Damp-proof courses and flashings—Methods of test, Method 9: Determining thickness

The sheet thickness measured a three points, equally spaced across the strip. The specimens tested in a conditioning room maintained at a temperature of 23 ±2°C and 60 ±5% relative humidity are shown in Table 12, below.

	In	Out
Date of Preconditioning:	26/10/2021	2/11/2021
Date of test:	3/11/2021	3/11/2021

TABLE 12 DETERMINING THICKNESS TEST RESULTS

Specimen No.	Length and Width of Test Specimen (mm)	Thickness (mm)
8416/49	290 x 50	1.43
8416/49	290 x 50	1.44
8416/49	290 x 50	1.46
8416/50	290 x 50	1.63
8416/50	290 x 50	1.59
8416/50	290 x 50	1.60
8416/51	290 x 50	1.42
8416/51	290 x 50	1.40
8416/51	290 x 50	1.45
	Mean	**1.49**

Comments

The Test Sample, as described, when subjected to the test methods of:
AS 4654.1:2012 Waterproofing membranes for external above-ground use Part 1: Materials.

Properties:	(a) water vapour transmission	
	(b) cyclic movement	CLASS III
	(c) durability	CLASS III
	(d) bond strength to concrete substrate	
	(e) membrane thickness	

Met the performance criteria

- Performed 1st Revalidation for Control samples with average Elongation at break% : 355%.

Prepared on behalf of CSIRO by

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End of report