



TEST REPORT

DC16981-05-1

REPORT ON TESTING OF ROOT REPELL MEMBRANE TO THE REQUIREMENTS OF AS 4654.1-2012

CLIENT

Ardex Australia Pty Ltd
PO Box 796
Seven Hills NSW 1730
Australia

TEST SUMMARY

Objective

Testing was completed of the Root Repell membrane to the requirements of AS 4654.1-2012 *Waterproofing membranes for external above-ground use Part 1: Materials*.

Summary

Passing results were obtained for the 1.26 mm thick Root Repell membrane where requirements are stated in the AS 4654.1-2012 Standard. The Root Repell membrane samples supplied met the requirements to be classified as Class III (High Extensibility).

Test sponsor

Ardex Australia Pty Ltd
PO Box 796
Seven Hills NSW 1730
Australia

Description of test specimen

The client supplied a roll of sheet membrane samples to be tested. The sheet samples were received on 8 January 2023 and assigned the BRANZ sample reference 23/016. The Root Repell membrane was supplied as a roll of sheet and was tested in both principal directions, with the Machine Direction (MD) and Cross Direction (CD) labelled by the client.

LIMITATION

The results reported here relate only to the items tested.

TERMS AND CONDITIONS

This report is issued in accordance with the Terms and Conditions as detailed and agreed in the BRANZ Services Agreement for this work.



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1. SCOPE

The client requested testing of the Root Repell membrane to the performance specifications of AS 4654.1-2012, Waterproofing membranes for external and above-ground use, Part 1: Materials. Testing was completed to AS 4654.1-2012 Table 2.1. An Instron 5569 Universal testing machine and a 10 kN load cell was used to provide a constant rate of elongation.

2. SUMMARY

Table 1: AS 4654.1-2012 Table 2.1 Requirements – Fully Bonded Membranes and Mechanically Fastened membranes – Root Repell membrane.

PROPERTY REQUIRED	METHOD	RESULTS		
		MD	CD	Pass/Fail
Abrasion resistance	AS 1580.403.2	N/A		Non-trafficable
Bond strength	ASTM C794	Plywood 44 N	Concrete 10 N	N/A
Cyclic movement	Moving Joint Test	Tested as Class III		Pass
Dimensional stability	ASTM D6207	-1 mm	+1 mm	N/A
Elongation at break	AS 4654.1-2012 Appendix A	577.4 %	577.7 %	N/A
Field seam strength	EN 12316.2, EN 12317.2	Shear: 276.1 N (End lap), 233.6 N (Side lap) Peel: 76.6 N (End lap), 88.1 N (Side lap)		N/A
Heat ageing ²	AS 4654.1-2012	575.1%	569.7 %	Pass
Temperature ² resistance	AS 4654.1-2012 Clause 2.6	571.1 %	575.2 %	Pass
Ultraviolet resistance	AS 4654.1-2012 Table A4	N/A	N/A	N/A
Tensile strength	AS 4654.1-2012 Table A4	4.96 MPa	4.20 MPa	N/A
Thickness	Various methods	1.26 mm	1.31 mm	N/A
Durability ^{1,2}	AS 4654.1-2012 Table A4	N/A	N/A	Pass
Water vapour transmission rate	ASTM E96	0.05 g/m ² /24 hours		N/A

Notes:

1. Durability of membranes is a combined group of assessments as detailed in AS 4654.1-2012 Appendix A, Table A4.
2. The majority of record results exceeded the frame limits.



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3. BOND STRENGTH

3.1 Testing

Testing was carried out on Root Repell in accordance with ASTM C794, with variations to the specimen preparation process. As the Root Repell is a sheet membrane, it was fully bonded to the substrate using adhesive (supplied by the client) in 25 mm wide strips and then peeled off using the membrane instead of mesh.

3.2 Results

Results are an average of 4 samples.

Table 3: Bond strength results

Substrate	Mean Force, N
Plywood	44
Concrete Masonry	10

4. CYCLIC MOVEMENT

4.1 Testing

Testing carried out in accordance with AS 4654.1-2012 Appendix B Assessment of resistance of waterproofing membranes to cyclic movement.

Sample	Root Repell (MD)
Sample code	23/016
Material class	Class III
Test time	2 hours
Cyclic extension	4 mm
Rate of extension	3.34 mm/min

4.2 Results

The test sample achieved a control elongation at break of 577.40 % MD and 577.68 % CD as per AS 4654-2012 Appendix A.

Number of cycles completed:	50
Surface crazing:	Nil
Surface tears:	Nil



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Membrane Rupture: Nil
Results Pass

For Class III high extensibility membranes, the minimum bond breaker/tape width to bridge joints opening up by 5 mm is 12 mm as per AS 4654.1-2012 Table A2.

5. CONTROL

5.1 Testing

Test carried out in accordance with AS 4654.1-2012 Appendix A in both principal directions.

5.2 Results

Results are an average of 6 samples.

Table 4: Control results for Root Repell in Machine Direction (MD).

Thickness (mm)	Max Load (N)	Max Stress (MPa)	Elongation at break (%)
1.26	156.3	4.96	577.4

Table 5: Control results for Root Repell in Cross Direction (CD).

Thickness (mm)	Max Load (N)	Max Stress (MPa)	Elongation at break (%)
1.31	137.1	4.20	577.7

Requirement for Class III: The specimens have an elongation at break of >300%.

Classification: Class III (High extensibility)

Note: Both MD and CD samples exceeded the Introns frame elongation capacity. The control specimens did not break during testing.

6. HEAT AGEING

6.1 Testing

Testing carried out in accordance with AS 4654.1-2012 Appendix A.

6.2 Results

Results are an average of 6 samples.

Table 6: Heat ageing results Root Repell MD.

Thickness (mm)	Max Load (N)	Max Stress (MPa)	Elongation at break (%)
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1.26	162.1	5.16	575.1
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Table 7: Heat ageing results Root Repell CD

Thickness (mm)	Max Load (N)	Max Stress (MPa)	Elongation at break (%)
1.32	147.3	4.47	569.7

Requirement: The specimens require an elongation at break greater than 50% of the control sample, 577.4 % MD and 577.7 % CD. An elongation of less than 288.7 % MD or 288.8 % CD is a fail.

Result: Pass

7. TEMPERATURE RESISTANCE

7.1 Testing

Testing carried out in accordance with AS 4654.1-2012 Clause 2.6. Samples were exposed for 2 days at -15°C and then exposed for 2 days at 85°C.

7.2 Results

Results are an average of 6 samples.

Table 8: Temperature resistance results Root Repell MD

Thickness (mm)	Max Load (N)	Max Stress (MPa)	Elongation at break (%)
1.33	151.7	4.58	571.1

Results are an average of 6 samples.

Table 9: Temperature resistance results Root Repell CD

Thickness (mm)	Max Load (N)	Max Stress (MPa)	Elongation at break (%)
1.29	134.9	4.18	575.2

Requirement: The membrane shall remain waterproof when subjected to temperatures likely to be encountered in use: for Australia these would be within the range -15°C to 85°C.

Samples shall exhibit no cracking, fractures, or surface defects after exposure.

Result: Pass



8. DURABILITY

8.1 Testing

Testing carried out in accordance with AS 4654.1-2012 Appendix A

8.2 Results

Table 12: Durability results Root Repell MD

Ageing	Aged period	Thickness (mm)	Max Load (N)	Max Stress (MPa)	Elongation at break (%)
De-ionised water	7 days	1.28	173.5	5.41	555.9
	28 days	1.30	169.5	5.22	544.5
	56 days	1.30	164.8	5.08	577.8
Detergent	7 days	1.24	171.3	5.52	551.7
	28 days	1.29	152.2	4.73	367.1*
	56 days	1.29	144.9	4.48	544.0

Elongation at break (Controls) = 577.4 %, Result = Pass

*note: Four of the test samples slipped during testing resulting in lower recorded extension values for the 28 day detergent samples.

Table 13: Durability Results Root Repell CD

Ageing	Aged period	Thickness (mm)	Max Load (N)	Max Stress (MPa)	Elongation at break (% of control)
De-ionised water	7 days	1.28	142.3	4.45	532.4
	28 days	1.28	148.6	4.63	574.4
	56 days	1.30	139.8	4.30	577.8
Detergent	7 days	1.28	132.6	4.15	456.1
	28 days	1.30	147.1	4.53	550.8
	56 days	1.31	136.7	4.18	575.0

Elongation at break (Controls) = 577.7 %, Result = Pass



9. DIMENSIONAL STABILITY

9.1 Testing

Testing carried out to ASTM D6207-03, Dimensional Stability of Fabrics to Changes in Humidity and Temperature with a variation in specimen lengths and measurement gauge length. Due to environmental chamber availability the specimen length was decreased to 850 mm and gauge marks were located at 750 mm from top of specimen. A 1m ruler was used instead of a specimen frame, measurement locations were clearly marked for measurement repeatability.

9.2 Results

Table 14: Dimensional Stability results for Root Repell.

Pointer Settings, mm	Sample 1 (MD)	Sample 2 (CD)
Initial Reading	748	749
After first humid cycle at 95% RH and 20°C	746	749
After first dry cycle at 15% RH and 32°C	747	748
After second humid cycle at 95% RH and 20°C	748	750
After second dry cycle at 15% RH and 32°C	747	750

No discolouration, bubbling or curling was observed during or after testing.

10. FIELD SEAM STRENGTH

10.1 Testing to EN 12316-2 Peel Resistance

Testing was carried out to EN 12316-2: Determination of peel resistance of joints – Part 2. Testing was completed on 23 May 2023.

10.2 Sampling

The client provided two jointed samples of Root Repell labelled with machine and cross direction. Machine direction samples were assumed to be end laps and cross direction samples were assumed to be side laps.



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10.3 Results

Table 15: Field Seam Strength Peel Resistance results for Root Repell.

Lap Type	Sample	Mean of 10 points (N)	Failure Mode	Mean Peel Force (N)
Side Lap	1	105.9	A	88.1
	2	67.8	A	
	3	73.3	A	
	4	88.7	A	
	5	104.7	A	
End Lap	6	84.7	A	76.6
	7	59.8	A	
	8	74.0	A	
	9	93.0	A	
	10	71.7	A	

Failure Modes are described as follows:

A = Peeling of the joint, B = Break outside of the joint, C = Delamination of sheet. In this case the area of delamination has to be more than 5% of the joint area.

Result: No failure of joint.

10.4 Testing to EN 12317-2 Shear Resistance

Testing was carried out to EN 12317-2: Determination of shear resistance of joints- Part 2. Testing was completed on 23 May 2023.

10.5 Sampling

The client provided two jointed samples of Root Repell labelled with machine and cross direction. Machine direction samples were assumed to be end laps and cross direction samples were assumed to be side laps.



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10.6 Results

Table 16: Field Seam Strength Shear Resistance results for Root Repell.

Lap Type	Sample	Max Load (N)	Failure Mode	Mean Max Load (N)
Side Lap	1	226.6	Separate/Split	233.6
	2	235.3	Separate/Split	
	3	230.8	Separate/Split	
	4	234.9	Separate/Split	
	5	240.4	Separate/Split	
End Lap	6	272.4	Separate/Split	276.1
	7	283.4	Separate/Split	
	8	273.4	Separate/Split	
	9	275.4	Separate/Split	
	10	275.7	Separate/Split	

11. WATER VAPOUR TRANSMISSION RATE

11.1 Testing

Testing carried out in accordance with ASTM E96 desiccant method.

11.2 Results

Table 17: Water vapour transmission rate results for Root Repell.

Thickness (mm)	WVTR (g/m ² /24 hours)	Minimum result (g/m ² /24 hours)	Maximum result (g/m ² /24 hours)
1.26	0.05	0.00	0.09



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