



## Industrial Research Services

Manufacturing & Materials Technology, 37 Graham Road (PO Box 56), Highett, Victoria 3190, Australia  
Telephone: 61 3 9252 6000 Facsimile: 61 3 9252 6244 Web: <http://www.cmmt.csiro.au>

**Registered Testing Authority - Building Code of Australia**

14 May 2007

Our Ref: EN13 / 1497 03/0211

### TEST REPORT No. 3795

**Requested by:** Rhino Linings Australasia  
Denis Baker  
**on (date):** 2 March 2007  
**Product Descriptions:** TUFF STUFF, waterproofing membrane  
**Manufacturer:** Rhino Linings Australasia

**Sampling Details** Supplied  
**Date:** 2 March 2007  
**How (methods):** Delivered to Highett

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This test report consists of 11 pages.

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#### SUMMARY OF ASSESSMENTS REPORTED

AS 4858:2004 Appendix A, Durability of waterproof membranes  
AS 4858:2004 Appendix B, Resistance of Waterproofing Membranes to Cyclic Movement  
AS 3558.-1999 Water Absorption  
ASTM E96 Moisture Vapour Transmission



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**SUMMARY OF RESULTS**

**AS4858:2004 Wet Area Membranes**

**Appendix A: Assessment of Durability of waterproof membranes**

The sample requires an elongation at break strain percentage greater than 215% at 56 days.  
Note: (215% equates to 50% of control elongation at break strain percentage).

Durability of membranes: Elongation to break	Strain %	
Control	431%	<b>Class III</b>
Water Immersion	397%	PASS
Detergent Immersion	416%	PASS
Bleach Immersion	318%	PASS
Heat Ageing	455%	PASS

Rhino Linings Australasia test sample, TUFF STUFF, waterproofing membrane achieves the performance requirements of Class III  
AS 4858: 2004 Durability of Membranes for **Class III** membrane.

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

Class III type membrane: 2mm gauge length for a 4mm extension, repeated 50 cycles.

Requirement: PASS No Fatigue cracking exhibited.  
Result: **PASS**

**The Water Vapour Transmission (WVT) in accordance to ASTM E96: 4.09g/m<sup>2</sup>/24h**

**Appendix C: Suitability of waterproofing membranes when used over particle board**

Appendix C **will not be** required as the TUFF STUFF has a water vapour transmission below 8g/m<sup>2</sup>/24h.

**AS 3558.1 Methods of testing plastics & composite materials sanitary plumbing fixtures:**

**Method 1: Determination of water absorption characteristics Mean 4.09%**

**Conclusion:** TUFF STUFF, waterproofing membrane complies with Class III waterproofing membrane according to AS4858.



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TEST CARRIED OUT IN ACCORDANCE WITH  
AS4858:2004 Wet Area Membranes  
Appendix A: Assessment of Durability of waterproof membranes

Test Date: 8 March 2007

RESULTS: Location: Ceramic Tile Laboratory  
Conditions: 7 days at 23°C 55%RH  
Sample Number: 3795 - 1 (Numbered 1 to 5)  
Samples: Average of 5 samples  
Load rate: 150mm/min

### Elongation at Break

#### CONTROL SET

Sample Number	Sample Thickness Mean (mm)	Maximum Load (N)	Maximum Extension (mm)	Maximum Stress MPa	Maximum Strain %
3795 - 1 1 to 5	2.8	118.81	142.33	7.07	431

**Requirement for Class I:**

The specimens have an average percentage strain of <70%.

**Requirement for Class II:**

The specimens have an average percentage strain of ≥70% & ≤299%.

**Requirement for Class III:**

The specimens have an average percentage strain of ≥300%.

**Classification:**

431% Class III (High Extensibility)



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Appendix A: Assessment of Durability of waterproof membranes

Test Date: 26 April 2007

RESULTS: Location: Ceramic Tile Laboratory  
Conditions: 7 days at 23°C 55%RH  
Sample Number: 3795 - 3 (Numbered 1 to 12)  
Samples: Average of 3 samples  
Load rate: 150mm/min  
Solution: 1L of deionised water

### Elongation at Break

### WATER IMMERSION

Period & Sample Number	Sample Thickness Mean (mm)	Maximum Load (N)	Maximum Extension (mm)	Maximum Stress MPa	Maximum Strain %
<b>7 Days</b> 3795 - 3 1 to 3	2.8	104.09	149.82	6.20	454
<b>28 Days</b> 3795 - 3 4 to 6	2.8	102.95	139.37	6.13	422
<b>56 Days</b> 3795 - 3 7 to 9	2.8	99.40	131.00	5.92	397

**Requirement:** The sample requires an elongation at break strain greater than 215% at 56 days.

**Result:** 397% **PASS**



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Appendix A: Assessment of Durability of waterproof membranes

Test Date: 26 April 2007

RESULTS: Location: Ceramic Tile Laboratory  
Conditions: 7 days at 23°C 55%RH  
Sample Number: 3795 - 4 (Numbered 1 to 12)  
Samples: Average of 3 samples  
Load rate: 150mm/min  
Solution: 1L of 2% solution N8 detergent

### Elongation at Break

#### DETERGENT IMMERSION

Period & Sample Number	Sample Thickness Mean (mm)	Maximum Load (N)	Maximum Extension (mm)	Maximum Stress MPa	Maximum Strain %
<b>7 Days</b> 3795 - 4 1 to 3	2.8	93.09	145.55	5.54	441
<b>28 Days</b> 3795 - 4 4 to 6	2.8	101.39	149.46	6.03	453
<b>56 Days</b> 3795 - 4 7 to 9	2.8	100.1	137.3	5.98	416

**Requirement:** The sample requires an elongation at break strain greater than 215% at 56 days. Between 138% and 277% additional bond strength is required.

**Result:** 4160% **PASS**



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Appendix A: Assessment of Durability of waterproof membranes

Test Date: 26 April 2007

RESULTS: Location: Ceramic Tile Laboratory  
Conditions: 7 days at 23°C 55%RH  
Sample Number: 3795 - 5 (Numbered 1 to 12)  
Samples: Average of 3 samples  
Load rate: 150mm/min  
Solution: 1L of 10.5 g/L sodium hypochlorite &  
2.25 g/L of sodium hydroxide

### Elongation at Break

### BLEACH IMMERSION

Period & Sample Number	Sample Thickness Mean (mm)	Maximum Load (N)	Maximum Extension (mm)	Maximum Stress MPa	Maximum Strain %
<b>7 Days</b> 3795 - 5 1 to 3	2.8	97.40	153.42	5.80	465
<b>28 Days</b> 3795 - 5 4 to 6	2.8	106.79	144.97	6.36	439
<b>56 Days</b> 3795 - 5 7 to 9	2.8	68.1	104.9	4.10	318

**Requirement:** The sample requires an elongation at break strain greater than 215% at 56 days.

**Result:** 318% **PASS**



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Appendix A: Assessment of Durability of waterproof membranes

Test Date: 8 April 2007

RESULTS: Location: Ceramic Tile Laboratory  
Conditioning: 7 days 23°C 55%RH  
5 days 50°C  
2 days 23°C 55%RH  
Sample Number: 3779 - 2 (Numbered 1 to 4)  
Samples: Average of 3 samples  
Load rate: 150mm/min

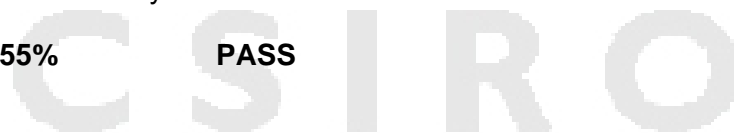
## Elongation at Break

### HEAT AGEING

Sample Number	Sample Thickness Mean (mm)	Maximum Load (N)	Maximum Extension (mm)	Maximum Stress MPa	Maximum Strain %
3795 - 2 1 to 4	3.0	137.77	150.04	7.65	455

**Requirement:** The sample requires an elongation at break strain greater than 277% at 7 days.

**Result:** 455% **PASS**





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Appendix B: Assessment of Resistance of waterproofing membranes to Cyclic Movement

Test Date: 20 March 2007

RESULTS: Location: Laboratory  
Test Rig: Applied Test Systems  
Series 904 Vertical Sealant Tester  
Number of Cycles: 50  
Type of Cycle: Full cycle  
Cycle Time: 2 hours to complete full cycle  
Cycle expansion: 50% of Control elongation at break  
Sample Size: 65mm x 25mm  
Sample Span: 2mm between header plates  
Sample Thickness: 2.8 mm

The test sample achieved a control Elongation of Break of 431% as per AS4858 Appendix A. For a Class III membrane type the extension movement used for cycling is 4.00mm extension.

Number of Cycles completed	50
Surface Crazeing	Nil
Surface Tears	Nil
Membrane Rupture	Nil

**Result:** Meets the requirement for Moving Joint Test

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Appendix C: Assessment of the suitability of waterproofing membranes when used over Particle Board  
Test Date: 10 May 2007

### Water Vapour Transmission to ASTM E96

RESULTS: Location: Ceramic Tile Laboratory  
Sample Thickness: 2.8mm  
Open mouth dish: Diameter 100mm  
Test Period: 480 hours  
Conditions: 23°C / RH 50%  
Membrane to dish sealant: silicon sealant  
Desiccant: Silica gel

#### Desiccant Method (Procedure A)

Sample	Thickness mm	Water Vapour Transmission	
		g/m <sup>2</sup> /hr	g/m <sup>2</sup> /24/hr
Specimen 1	2.8	0.007	3.65
Specimen 2	2.8	0.008	4.33
Specimen 3	2.8	0.008	4.27
<b>Mean</b>	2.8	0.007	<b>4.09</b>

**Requirement:** If > 8g/m<sup>2</sup>/24 hours, additional testing referred to in (e) of Table A1 will be required to establish suitability for use over particleboard.

**Result:** 4.09g/m<sup>2</sup>/24 hours **PASS**

**The sample passes E96 WVT, thus a test to suitability over particle board is not required.**



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Appendix A: Assessment of Durability of waterproof membranes

Test Date: 19 April 2007

RESULTS: Location: Ceramic Tile Laboratory  
Sample Thickness: 0.8 mm  
Test Period: 24 hours  
Conditions: 23°C / RH 50%

Sample	Thickness (mm)	Water Absorption		% Water Absorption
		Mass (m1)	Mass (m2)	
Specimen 1	2.8	138.42	138.91	2.3
Specimen 2	2.8	137.19	137.83	3.0
Specimen 3	2.8	136.23	136.61	1.7
Maximum	2.8			<b>2.3</b>

**Requirement:** Determine maximum water absorption as mean difference 2.3%

**Result:** 2.3%

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Date and Place 14 May 2007 Highett, Vic

Name, Title and Signature:



**PETER WETSGATE  
PROJECT LEADER  
SLIPS, SURFACES & FINISHES  
INDUSTRIAL RESEARCH SERVICES**

**CSIRO**