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Telephone: 61 3 9252 6000 Facsimile: 61 3 9252 6244 Web: http://www.cmmt.csiro.au

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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.

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%	**Class III**
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 IIII 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/m²/24h

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/m²/24h.

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 IIII waterproofing membrane according to AS4858.

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TEST CARRIED OUT IN ACCORDANCE WITH Test Date: 8 March 2007
AS4858:2004 Wet Area Membranes
Appendix A: Assessment of Durability of waterproof membranes

RESULTS:
Location: Ceramic Tile Laboratory
Conditions: 7 days at 23ºC 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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TEST CARRIED OUT IN ACCORDANCE WITH Test Date: 26 April 2007
AS4858:2004 Wet Area Membranes
Appendix A: Assessment of Durability of waterproof membranes

RESULTS:

Location:	Ceramic Tile Laboratory
Conditions:	7 days at 23ºC 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 %
7 Days 3795 – 3 1 to 3	2.8	104.09	149.82	6.20	454
28 Days 3795 – 3 4 to 6	2.8	102.95	139.37	6.13	422
56 Days 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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TEST CARRIED OUT IN ACCORDANCE WITH Test Date: 26 April 2007
AS4858:2004 Wet Area Membranes
Appendix A: Assessment of Durability of waterproof membranes

RESULTS:

Location:	Ceramic Tile Laboratory
Conditions:	7 days at 23ºC 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 %
7 Days 3795 – 4 1 to 3	2.8	93.09	145.55	5.54	441
28 Days 3795 – 4 4 to 6	2.8	101.39	149.46	6.03	453
56 Days 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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TEST CARRIED OUT IN ACCORDANCE WITH Test Date: 26 April 2007
AS4858:2004 Wet Area Membranes
Appendix A: Assessment of Durability of waterproof membranes

RESULTS:

Location:	Ceramic Tile Laboratory
Conditions:	7 days at 23ºC 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 %
7 Days 3795 – 5 1 to 3	2.8	97.40	153.42	5.80	465
28 Days 3795– 5 4 to 6	2.8	106.79	144.97	6.36	439
56 Days 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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TEST CARRIED OUT IN ACCORDANCE WITH Test Date: 8 April 2007
AS4858:2004 Wet Area Membranes
Appendix A: Assessment of Durability of waterproof membranes

RESULTS:

Location:	Ceramic Tile Laboratory
Conditioning:	7 days 23ºC 55%RH 5 days 50ºC 2 days 23ºC 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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TEST CARRIED OUT IN ACCORDANCE WITH Test Date: 20 March 2007
AS4858:2004 Wet Area Membranes
Appendix B: Assessment of Resistance of waterproofing membranes to Cyclic Movement

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 Crazing	Nil
Surface Tears	Nil
Membrane Rupture	Nil

Result: Meets the requirement for Moving Joint Test

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TEST CARRIED OUT IN ACCORDANCE WITH Test Date: 10 May 2007
AS4858:2004 Wet Area Membranes
Appendix C: Assessment of the suitablility of waterproofing membranes when used over Particle Board

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:	23ºC / RH 50%
Membrane to dish sealant:	silicon sealant
Desiccant:	Silica gel

Desiccant Method (Procedure A)

Sample	Thickness mm	Water Vapour Transmission g/m^2/hr	g/m^2/24/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
Mean	2.8	0.007	**4.09**

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

Result: **4.09g/m^2/24 hours PASS**

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

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TEST CARRIED OUT IN ACCORDANCE WITH Test Date: 19 April 2007
AS4858:2004 Wet Area Membranes
Appendix A: Assessment of Durability of waterproof membranes

RESULTS:

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

Sample	Thickness (mm)	Water Absorption Mass (m1)	Mass (m2)	% Water Absorption
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			**2.3**

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