

Rhino Linings Australasia Pty Ltd  
Attn: Dennis Baker  
501-505 Olsen Ave  
Molendinar  
QLD 4214  
AUSTRALIA

19/01/2009

Dear Dennis,

Please find the attached report to AS/NZS 4020:2005 for Tuff Stuff submitted for testing.

Should you have any enquiries about the report or any other matters pertaining to the Standard please contact the laboratory on 61 08 8259 0332

Yours sincerely,



Michael Glasson  
Product Testing Team Leader

## FINAL REPORT

### Report Information

**Report ID :** 46641

**Submitting Organisation :** 00109322 : Rhino Linings Australasia Pty Ltd

**Account :** 130299 : Rhino Linings Australasia Pty Ltd - AS/NZS 4020 Testing

**AWQC Reference :** 130299-2008-CSR-1 : Prod Test: Polyurethane Membrane

**Project Reference :** PT-783

**Product Designation :** Tuff Stuff

**Composition of Product :** Urethane.

**Product Manufacturer :** Rhino Linings Australasia Pty Ltd, Molendinar, QLD, Australia.

**Use of Product :** In-Line. Coating System.

**Sample Selection:** As provided by the submitting organisation.

**Testing Requested :** **AS/NZS 4020:2005 TESTING OF PRODUCTS FOR USE IN CONTACT WITH DRINKING WATER**

**Product Type :** Composite

**Samples :** Samples were prepared and controlled as described in Appendix A of AS/NZS 4020:2005

**Extracts :** Extracts were prepared as described in Appendix C, D, E, F, G, H.

**Project Completion Date :** 14-Jan-2009

**Project Comment :** The results presented herein demonstrate compliance of Tuff Stuff to AS/NZS 4020 when exposed at area to volume ratios up to 15,000 mm<sup>2</sup>/L.

PLEASE NOTE THAT THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL

THE RESULTS STATED IN THIS REPORT RELATE TO THE SAMPLE OF THE PRODUCT SUBMITTED FOR TESTING. ANY CHANGES IN THE MATERIAL FORMULATION, PROCESS OF MANUFACTURE, THE METHOD OF APPLICATION, OR THE SURFACE AREA-TO-VOLUME RATIO IN THE END USE, COULD AFFECT THE SUITABILITY OF THE PRODUCT FOR USE IN CONTACT WITH DRINKING WATER



Michael Glasson  
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### Summary of Results

APPENDIX	RESULTS
C – Taste of Water Extract	Passed at an exposure of 15000 mm2 per Litre.
D – Appearance of Water Extract	Passed at an exposure of 15000 mm2 per Litre.
E – Growth of Aquatic Micro-organisms	Passed at an exposure of 15000 mm2 per Litre.
F – Cytotoxic Activity of Water Extract	Passed at an exposure of 15000 mm2 per Litre.
G – Mutagenic Activity of Water Extract	Passed at an exposure of 15000 mm2 per Litre.
H – Extraction of Metals	Passed at an exposure of 15000 mm2 per Litre.

**Summary Comment :** Not applicable.

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### CLAUSE 6.2 Taste of Water Extract

<b>Sample Description</b>	The sample consisted of a panel with dimensions 75 mm x 100 mm providing a surface area of approximately 15,000 mm <sup>2</sup> per Litre. Extracts were prepared using 1000 mL volumes of 50 mg/L hardness water.
<b>Extraction Temperature</b>	20°C ± 2°C.
<b>Test Method</b>	Taste of Water Extract (Appendix C)
<b>Scaling Factor</b>	Not applied.
<b>Results</b>	Not detected.
<b>Evaluation</b>	The product passed the requirements of clause 6.2 when tested at an exposure of 15,000 mm <sup>2</sup> per Litre.
<b>Number of Samples</b>	2.
<b>Test Comment</b>	Not applicable.



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### CLAUSE 6.3 Appearance of Water Extract

**Sample Description** The sample consisted of a panel with dimensions 75 mm x 100 mm providing a surface area of approximately 15,000 mm<sup>2</sup> per Litre. Extracts were prepared using 1000 mL volumes of 50 mg/L hardness water.

**Extraction Temperature** 20°C ± 2°C.

**Test Method** Appearance of Water Extract (Appendix D)

**Scaling Factor** Not applied.

#### Results

	<u>Test (- Blank)</u>	<u>Maximum Allowed</u>	<u>Units</u>
Colour	<1	5	HU
Turbidity	<0.1	0.5	NTU

**Evaluation** The product passed the requirements of clause 6.3 when tested at an exposure of 15,000 mm<sup>2</sup> per Litre.

**Number of Samples** 1.

**Test Comment** Not applicable.



Roger Kennedy  
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### CLAUSE 6.4 Growth of Aquatic Micro-organisms

**Sample Description** The sample consisted of a panel with dimensions 75 mm x 100 providing a surface area of approximately 15,000 mm<sup>2</sup> per Litre. Extracts were prepared using 1000 mL volumes of test water.

**Test Method** Growth of Aquatic Micro-organisms (Appendix E)

**Inoculum** The volume of the inoculum was 100 mL

**Scaling Factor** Not applied.

#### Results

Mean Dissolved Oxygen	Control	7.3 mg/L
Mean Dissolved Oxygen Difference	Positive Reference	4.7 mg/L
	Negative Reference	<0.1 mg/L
	Test	0.40 mg/L

**Evaluation** The product passed the requirements of clause 6.4 when tested at an exposure of 15,000 mm<sup>2</sup> per Litre.

**Number of Samples** 1.

**Test Comment** Not applicable.



Stephanie Semczuk  
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### CLAUSE 6.5 Cytotoxic Activity of Water Extract

<b>Sample Description</b>	The sample consisted of a panel with dimensions 75 mm x 100 mm providing a surface area of approximately 15,000 mm <sup>2</sup> per Litre. Extracts were prepared using 1000 mL volumes of 50 mg/L hardness water.
<b>Extraction Temperature</b>	20°C ± 2°C.
<b>Test Method</b>	Cytotoxic Activity of Water Extract (Appendix F)
<b>Scaling Factor</b>	Not applied.
<b>Results</b>	Non-cytotoxic.
<b>Evaluation</b>	The product passed the requirements of clause 6.5 when tested at an exposure of 15,000 mm <sup>2</sup> per Litre.
<b>Number of Samples</b>	1.
<b>Test Comment</b>	Not applicable.



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### CLAUSE 6.6 Mutagenic Activity of Water Extract

**Sample Description** The sample consisted of a panel with dimensions 75 mm x 100 mm providing a surface area of approximately 15,000 mm<sup>2</sup> per Litre. Extracts were prepared using 1000 mL volumes of 50 mg/L hardness water.

**Extraction Temperature** 20°C ± 2°C.

**Test Method** Mutagenic Activity of Water Extract (Appendix G)

**Scaling Factor** Not applied.

#### Results

Bacteria Strain	Number of Revertants per Plate				
	S9	Blank	Sample Extract	Positive Controls	
<i>Salmonella typhimurium</i> TA98	-	46, 57, 43	39, 30, 36	3007, 3126, 3257	<u>NPD</u> (20µg)
Mean ± Standard deviation		48.7 ± 7.4	35.0 ± 4.6	3130.0 ± 125.0	
	+	55, 45, 44	44, 41, 43	2570, 2021, 2175	<u>2-AF</u> (20µg)
Mean ± Standard deviation		48.0 ± 6.1	42.7 ± 1.5	2255.3 ± 283.2	
<i>Salmonella typhimurium</i> TA100	-	139, 125, 133	179, 151, 188	580, 555, 555	<u>Azide</u> (1.0µg)
Mean ± Standard deviation		132.3 ± 7.0	172.7 ± 19.3	563.3 ± 14.4	
	+	150, 136, 145	147, 191, 180	1235, 1055, 1231	<u>2-AF</u> (20µg)
Mean ± Standard deviation		143.7 ± 7.1	172.7 ± 22.9	1173.7 ± 102.8	
<i>Salmonella typhimurium</i> TA102	-	348, 439, 377	440, 378, 408	1305, 2223, 1795	<u>Mitomycin C</u> (2µg)
Mean ± Standard deviation		388.0 ± 46.5	408.7 ± 31.0	1774.3 ± 459.3	
	+	406, 397, 450	443, 376, 405		
Mean ± Standard deviation		417.7 ± 28.4	408.0 ± 33.6		

**Comments** S9 was used as a metabolic activator. NPD (4-nitro-o-phenylenediamine), Azide, and Mitomycin C are specific positive controls for strains TA98, TA100 and TA102 respectively while 2 - AF (2-aminofluorene) when used in conjunction with S9 is a positive control for both TA98 and TA100

**Evaluation** The product passed the requirements of clause 6.6 when tested at an exposure of 15,000 mm<sup>2</sup> per Litre.

**Number of Samples** 1.

**Test Comment** Not applicable.



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### CLAUSE 6.7 Extraction of Metals

**Sample Description** The sample consisted of a panel with dimensions 75 mm x 100 mm providing a surface area of approximately 15,000 mm<sup>2</sup> per Litre. Extracts were prepared using 1000 mL volumes of 50 mg/L hardness water.

**Extraction Temperature** 20°C ± 2°C.

**Test Method** Extraction of Metals (Appendix H)

**Scaling Factor** Not applied.

**Method of Analysis** All methods used to determine concentrations of metals are based on those described in the 21st edition of Standard Methods for the Examination of Water and Wastewater published by the APHA, AWWA and WEF (2005). The methods have been adapted for the instrumentation in use at the Australian Water Quality Centre. Concentration of the metals described in Table 2 of the AS/NZS 4020:2005 are determined as follows:  
Antimony, Arsenic, Barium, Cadmium, Chromium, Copper, Lead, Mercury, Molybdenum, Nickel and Selenium by inductively coupled plasma mass spectrometry.  
Silver by graphite furnace absorption spectrophotometry (Varian).

Results	Limit of Reporting mg/L	Blank mg/L	Test 1 mg/L	Test 2 mg/L	Max Allowed mg/L
<b>Final Extract</b>					
Antimony	0.0005	<0.0005	<0.0005	<0.0005	0.003
Arsenic	0.001	<0.001	<0.001	<0.001	0.007
Barium	0.0005	<0.0005	<0.0005	<0.0005	0.7
Cadmium	0.0005	<0.0005	<0.0005	<0.0005	0.002
Chromium	0.003	<0.003	<0.003	<0.003	0.05
Copper	0.0010	<0.0010	<0.0010	<0.0010	2.0
Lead	0.0005	<0.0005	<0.0005	<0.0005	0.01
Mercury	0.0003	<0.0003	<0.0003	<0.0003	0.001
Molybdenum	0.0005	<0.0005	<0.0005	<0.0005	0.05
Nickel	0.0005	<0.0005	<0.0005	<0.0005	0.02
Selenium	0.003	<0.003	<0.003	<0.003	0.01
Silver	0.0002	<0.0002	<0.0002	<0.0002	0.1

**Evaluation** The product passed the requirements of clause 6.7 when tested at an exposure of 15,000 mm<sup>2</sup> per Litre.

**Number of Samples** 1.

**Test Comment** Not applicable.



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