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Australian Water Quality Centre

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

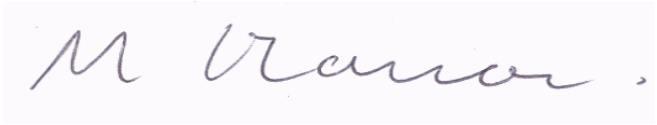
19/01/2009

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

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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 mm2/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



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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

Sample Description	The sample consisted of a panel with dimensions 75 mm x 100 mm providing a surface area of approximately 15,000 mm2 per Litre. Extracts were prepared using 1000 mL volumes of 50 mg/L hardness water.
Extraction Temperature	20°C ± 2°C.
Test Method	Taste of Water Extract (Appendix C)
Scaling Factor	Not applied.
Results	Not detected.
Evaluation	The product passed the requirements of clause 6.2 when tested at an exposure of 15,000 mm2 per Litre.
Number of Samples	2.
Test Comment	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 mm2 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

	Test (- Blank)	Maximum Allowed	Units
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 mm2 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 mm2 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 mm2 per Litre.

Number of Samples 1.

Test Comment Not applicable.

Stephanie Semczuk
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CLAUSE 6.5 Cytotoxic 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 mm2 per Litre. Extracts were prepared using 1000 mL volumes of 50 mg/L hardness water.
Extraction Temperature	20°C ± 2°C.
Test Method	Cytotoxic Activity of Water Extract (Appendix F)
Scaling Factor	Not applied.
Results	Non-cytotoxic.
Evaluation	The product passed the requirements of clause 6.5 when tested at an exposure of 15,000 mm2 per Litre.
Number of Samples	1.
Test Comment	Not applicable.

Stella Fanok
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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 mm2 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	S9	Blank	Sample Extract	Positive Controls	Number of Revertants per Plate
Salmonella typhimurium TA98	-	46, 57, 43	39, 30, 36	3007, 3126, 3257	NPD (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	2-AF (20µg)
Mean ± Standard deviation		48.0 ± 6.1	42.7 ± 1.5	2255.3 ± 283.2	
Salmonella typhimurium TA100	-	139, 125, 133	179, 151, 188	580, 555, 555	Azide (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	2-AF (20µg)
Mean ± Standard deviation		143.7 ± 7.1	172.7 ± 22.9	1173.7 ± 102.8	
Salmonella typhimurium TA102	-	348, 439, 377	440, 378, 408	1305, 2223, 1795	Mitomycin C (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 mm2 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 mm2 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
Final Extract					
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 mm2 per Litre.

Number of Samples 1.

Test Comment Not applicable.



Dzung Bui
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