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AS/NZS 4020:2005 Compliance Testing

Certificate of Analysis *(Supersedes all interim reporting)*

Dated: 07/07/11

CUSTOMER: Viking Group Ltd
80 Alexander Cres
Otara, Auckland
New Zealand

OUR REF: 1102931

ATTN: Rod McAneaney

DATE RECEIVED: 25/03/11

INTERIM REPORTING: 06/05/11
(email)

DATE COMMENCED: 29/03/11

DATE COMPLETED: 06/07/11

1. SAMPLES FOR TESTING:

*** Description:**

Enviroclad TPO Membrane

Batch Number: OXMJFB300428

Manufacture Date: 12/04/2009

Sample Size: 15 x (12mm x 61mm) heat welded
back to back

*** Testing Procedure / Background
Information:**

Testing is based on the recommended "total immersion" exposure of ~15,000mm² / 1L test water at (20 ± 2)°C to cover a cold water application up to <40°C. This testing exposure will cover end-usage of this product type.

Refer to **Attachment A** for Material Safety Data Sheet for Sure-Weld Reinforced TPO Membrane.

*** Product Use:**

In-Line



This document is issued in accordance with
NATA's accreditation requirements

Accreditation NO: 15773

Accredited for compliance with ISO/IEC 17025

ams Laboratory Final Report for the testing of a product to AS/NZS 4020, Products for use in contact with Drinking Water	AMS Report No.: 1102931
Submitting Organisation: Viking Group Ltd	
Product: Enviroclad TPO Membrane	Date of Report: 07/07/11

- * **General Composition:** Thermoplastic Polyolefin
(including type of wetted materials and supplier/manufacturers)
- * **Trade Name and Reference of Product:** Enviroclad TPO Membrane
- * **Product Manufacturer:** Carlisle Syntec
- * **Place of Manufacture:** 1285 Ritner Highway Carlisle P.A 17013 USA
- * **Submitting Organisation:** Viking Group Ltd
- * **Sampling Organisation:** Viking Group Ltd
- * **Type of certification:** NA
- * **Certifying Body:** NA
(including contact person and mailing address)
- * **Temperature range:** (0 – 30)°C
- * **Other testing:** BS6920 (2003)
- * **Previous testing:** NA

* Based on product submission information supplied by customer.

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2. TASTE OF WATER EXTRACT:

Methodology: AS/NZS 4020, *Appendix C* and in-house method TMP-191130.

Extraction temperature: $(20 \pm 2)^{\circ}\text{C}$

Exposure: “total immersion”; $\sim 15,000\text{mm}^2 / \text{L}$ test water

No. of samples tested: 2 x samples; 1 for chlorine-free test extract & 1 for chlorinated test extract

Following test extractions, the final 9-day test extracts were used to prepare taste test dilutions: 1/8, 1/4, 1/2, with 1/2 as first dilution.

TEST EXTRACT	TEST WATER TYPE	NO. OF TASTERS	TASTE + / -	TASTE DESCRIPTION (No. of tasters)	TEST DILUTION *(taste intensity)
TEST BLANK Final 9-day:	Chlorine-free	5	-	NA	NA
SAMPLE EXTRACT Final 9-day:	Chlorine-free	5	-	NA	NA
TEST BLANK Final 9-day:	Chlorinated	4	-	NA	NA
SAMPLE EXTRACT Final 9-day:	Chlorinated	4	-	NA	NA

+ Taste detected - No taste detected NA Not applicable

AS/NZS 4020 test requirement: Minimum of 4 tasters with no discernible taste at the first 1/2 dilution.

Note: * Tasters are given a 14-point scale to describe its intensity, with minimum of 1 as extremely weak, and maximum of >14 as extremely strong. An average of all tasters represents taste intensity.

EVALUATION:

On the basis of these results, the product complies with test requirements of AS/NZS 4020:2005, Taste of Water Extract; *Appendix C*, at the recommended “total immersion” exposure of $\sim 15,000\text{mm}^2 / \text{L}$ test water at $(20 \pm 2)^{\circ}\text{C}$ to cover a cold water application up to $<40^{\circ}\text{C}$.

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3. APPEARANCE OF WATER EXTRACT:

Methodology: AS/NZS 4020, *Appendix D* and in-house methods TMP-191140 and TMP-191106.

Extraction temperature: $(20 \pm 2)^{\circ}\text{C}$

Exposure: “total immersion”; $\sim 15,000\text{mm}^2$ / L test water

No. of samples tested: 1 x sample

Results for the first 24h test extract:

	a) TRUE COLOUR: Hazen Units (HU)	b) TURBIDITY: Nephelometric Turbidity Units (NTU)
	First 24h Extract	First 24h Extract
Sample Extract pH = 8.27	<2	0.64
Test Blank pH = 8.15	<2	0.28
FINAL RESULT	<2	0.36
AS/NZS 4020 Test sample requirements	≤ 5	≤ 0.5

< = less than

\leq = less than or equal to

For test a), test extractions were performed by AMS Laboratories Pty. Ltd. The test extracts were subsequently subcontracted to National Measurement Institute for assessment (NATA Accreditation No. 198), Report No. RN849777.

EVALUATION:

On the basis of these results, the product complies with the test requirements of AS/NZS 4020:2005, Appearance of Water Extract; *Appendix D*, at the recommended “total immersion” exposure of $\sim 15,000\text{mm}^2$ / L test water at $(20 \pm 2)^{\circ}\text{C}$ to cover a cold water application up to $<40^{\circ}\text{C}$.

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4. GROWTH OF AQUATIC MICRO-ORGANISMS:

Methodology: AS/NZS 4020, *Appendix E* and in-house method TMP-191150.

Incubation temperature: (30 ± 1)°C

Exposure: “total immersion”; ~15,000mm² / L test water

No. of samples tested: 1 x sample

Inoculum: 100mL for Sample, 110mL for Controls and 120mL for Test Blank

Jar Size: Calibrated for 1.0L for Sample, 1.1L for Controls and 1.2L for Test Blank due to headspace of test jars

GLASS JAR	* MEAN DISSOLVED OXYGEN DIFFERENCE (MDOD) in mg/L
TEST PRODUCT (Sample)	<0.01
NEGATIVE REFERENCE CONTROL (~15,000mm ² glass plate)	0.01
POSITIVE REFERENCE CONTROL (~15,000mm ² paraffin waxed glass plate)	6.74
TEST BLANK	7.21 in mg/L as mean dissolved oxygen

* Difference from test blank and represents mean of triplicate readings (weeks 5, 6, 7)

AS/NZS 4020 test sample requirements: Less than or equal to 2.4 for MDOD

EVALUATION:

On the basis of these results, the product complies with the test requirements of AS/NZS 4020:2005 Growth of Aquatic Micro-organisms; *Appendix E*, at the recommended ‘total immersion’ exposure of ~15,000mm² pipe / L test water at ~30°C.

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5. CYTOTOXIC ACTIVITY OF WATER EXTRACT:

Methodology: AS/NZS 4020, *Appendix F* and in-house method TMP-191160.

Extraction temperature: (20 ± 2)°C

Exposure: “total immersion”; ~15,000mm² / L test water

No. of samples tested: 1 x sample

The test sample extracts from the product, as well as the test blank (test water) were used to prepare a nutrient growth medium, subsequently utilised to grow a monkey kidney cell line (VERO ATCC CCL 81).

MICROSCOPIC EXAMINATION	Test Sample Extract (24h, 48h and 72h)	Test Blank (24h, 48h and 72h)
Cell Morphology:	Satisfactory	Satisfactory
Monolayer: Confluence/Healthy Growth as ~%	100%	100%

Cytotoxicity was detected with zinc sulphate, used as a positive control and analysed at 4µg/g, 8µg/g and 16µg/g of zinc. Water for Irrigation, Synthetic Water for Irrigation, and Phosphate Buffer Solution were included with the test blank as negative controls.

EVALUATION:

On the basis of these results, the test extracts of this product have shown a non-cytotoxic response, and the product therefore complies with the test requirements of AS/NZS 4020:2005, Cytotoxic Activity of Water Extract; *Appendix F*, at the recommended “total immersion” exposure of ~15,000mm² / L test water at (20 ± 2)°C to cover a cold water application up to <40°C.

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6. MUTAGENIC ACTIVITY OF WATER EXTRACT:

Methodology: AS/NZS 4020, *Appendix G* and in-house method TMP-191170.

Extraction temperature: (20 ± 2)°C

Exposure: "total immersion"; ~15,000mm² / L test water

No. of samples tested: 1 x sample

Results for the first 24h test extract:

BACTERIAL STRAIN: <i>Salmonella typhimurium</i>	* S9 -No +With	a) TRIPLICATES (REVERTANTS/PLATES) DEVIATION		b) MEAN ± STANDARD	
		TEST BLANK (Extractant Water)	SAMPLE EXTRACT (Leachate)	Negative Control (Test culture only)	Positive Control (Standard diagnostic mutagen)
TA 98	-	a)	a)	a)	a)
		23 21 23	19 28 20	15 23 39	I 2,280 2,630 2,170
TA 98	+	b)	b)	b)	b)
		22 ± 1	22 ± 5	26 ± 12	2,360 ± 240
TA 98	-	a)	a)	a)	a)
		55 61 69	45 42 40	45 55 48	IV 2,450 2,670 2,520
TA 100	-	b)	b)	b)	b)
		62 ± 7	42 ± 3	49 ± 5	2,547 ± 112
TA 100	-	a)	a)	a)	a)
		233 182 278	219 256 171	240 256 306	II 6,260 8,640 8,340
TA 100	-	b)	b)	b)	b)
		231 ± 48	215 ± 43	267 ± 34	7,747 ± 1,296

* Metabolic Activator

II = sodium azide

NA = Not applicable

III = Benzo(a)pyrene

> = greater than

IV = 2-aminoanthracene

I = 2, 4-dinitrophenylhydrazine

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BACTERIAL STRAIN: <i>Salmonella typhimurium</i>	* S9 -No +With	a) TRIPLICATES (REVERTANTS/PLATES) DEVIATION		b) MEAN ± STANDARD	
		TEST BLANK (Extractant Water)	SAMPLE EXTRACT (Leachate)	Negative Control (Test culture only)	Positive Control (Standard diagnostic mutagen)
		a)	a)	a)	a)
TA 100	+	603 617 599	569 545 561	465 471 458	III 6,880 7,110 7,930
		b) 606 ± 9	b) 558 ± 12	b) 465 ± 7	b) 7,307 ± 552
TA 102	-	454 498 489	461 459 453	327 414 387	I 5,140 5,440 5,510
		b) 480 ± 23	b) 458 ± 4	b) 376 ± 45	b) 5,363 ± 197
TA 102	+	543 548 537	523 510 497	455 461 463	IV 6,260 6,320 6,410
		b) 543 ± 6	b) 510 ± 13	b) 460 ± 4	b) 6,330 ± 75

* Metabolic Activator NA = Not applicable > = greater than I = 2, 4-dinitrophenylhydrazine
 II = sodium azide III = Benzo(a)pyrene IV = 2-aminoanthracene

AS/NZS 4020 test sample requirements: (The differences in the mean number of revertants between either of the negative controls and test sample extracts should not exceed two standard deviations (for triplicate analysis)).

Positive response: If mean revertants for sample extract outside the range of spontaneous revertants for test strain.

EVALUATION:

On the basis of these results, the test extract has shown a non-mutagenic response and the product therefore complies with the test requirements of AS/NZS 4020:2005, Mutagenic Activity of Water Extract; *Appendix G*, at the recommended "total immersion" exposure of ~15,000mm² / L test water at (20 ± 2)°C to cover a cold water application up to <40°C.

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7. EXTRACTION OF METALS:

Methodology: AS/NZS 4020, *Appendix H* and in-house methods TMP-191180 and TMP-191230.

Extraction temperature: (20 ± 2)°C

Exposure: “total immersion”; ~15,000mm² / L test water

No. of samples tested: 2 x samples

Results for the first 24h test extract:

Element	In-House Method	AS/NZS 4020: Maximum Allowable Concentration mg/L (ppm)	Limit of Reporting mg/L (ppm)	Sample Extract I mg/L (ppm)	Sample Extract II mg/L (ppm)	Test Blank mg/L (ppm)	FINAL RESULT I mg/L (ppm)	FINAL RESULT II mg/L (ppm)
antimony ¹ (Sb)	NT2_47	0.003	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
arsenic ² (As)	NT247_251	0.007	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
barium ¹ (Ba)	NT2_47	0.7	0.001	<0.001	<0.001	0.004	<0.001	<0.001
cadmium ¹ (Cd)	NT2_47	0.002	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
chromium ¹ (Cr)	NT2_47	0.05	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
copper ¹ (Cu)	NT2_47	2	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
lead ¹ (Pb)	NT2_47	0.01	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
mercury ³ (Hg)	NT2_47_244	0.001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
molybdenum ¹ (Mo)	NT2_47	0.05	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
nickel ¹ (Ni)	NT2_47	0.02	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
selenium ² (Se)	NT247_251	0.01	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
silver ¹ (Ag)	NT2_47	0.1	0.001	<0.001	<0.001	<0.001	<0.001	<0.001

< = less than mg/L = milligram per litre ¹ = ICPMS ² = ICPMS (hydride generation) ³ = CVAAS

Test extractions were performed by AMS Laboratories Pty. Ltd. The test extracts were subsequently subcontracted to National Measurement Institute for assessment (NATA Accreditation No. 198), Report No. RN849713.

EVALUATION:

On the basis of these results, the product complies with the test requirements of AS/NZS 4020:2005, Extraction of Metals; *Appendix H*, at the recommended “total immersion” exposure of ~15,000mm² / L test water at (20 ± 2)°C to cover a cold water application up to <40°C.


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8. SUMMARY & CONCLUSION:

APPENDIX	RESULTS
C - TASTE	PASS at testing exposure
D - APPEARANCE	PASS at testing exposure
E - GROWTH OF AQUATIC MICRO-ORGANISMS	PASS at testing exposure
F - CYTOTOXIC ACTIVITY	PASS at testing exposure
G - MUTAGENIC ACTIVITY	PASS at testing exposure
H - EXTRACTION OF METALS	PASS at testing exposure

Based on completion and evaluation of all tests on 07/07/11, the product, **Enviroclad TPO Membrane**; **fully complies with the test requirements of AS/NZS 4020:2005 to cover a cold water application up to <40°C, at the recommended “total immersion” exposure of ~15,000mm² / L test water at (20 ± 2)°C. This testing exposure will cover end-usage of this product type.**

Testing although determined by the relevant product Standard, is generally recognised for up to 5 years by the certifying body, providing the testing procedures remain the same, and the background information on all wetted parts and the product are adequately documented. Also, the results stated in the report relate to the samples of the product submitted for testing. Any changes in the material formulation and supplier/manufacturer of all wetted items, the 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, and re-testing may be required before this actual time frame, governed by the completion and evaluation date.

Signed: 
 Ms Lan Le, B. MedSc, MSc (Microbiology).
 Chemistry and Toxicology; Acting Manager; Approved Signatory



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