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GPO Box 1751
Adelaide SA 5001

250 Victoria Square
Adelaide SA 5000

Tel: 1300 653 366
Fax: 1300 883 196

Internet: www.awqc.com.au
Email: awqc@sawater.com.au

Australian Water Quality Centre

FINAL REPORT

REPORT ID	128971V

REPORT INFORMATION

SUBMITTING ORGANISATION	00109049: VIPAC Engineers & Scientists Ltd
ACCOUNT	130044: VIPAC Engineers & Scientists Ltd – AS/NZS 4020 Testing.
AWQC REFERENCE	130044-2012-CSR-13 Prod Test: Valsir System.
PROJECT REFERENCE	PT-2141V
PRODUCT DESIGNATION	Valsir 16 x 16 90° ELBOW and PE-X /Al/PE-X Multilayer Pipe.
COMPOSITION OF PRODUCT	PPSU Plastic Elbow Fitting and PE-X/Al/PE-X Pipe.
PRODUCT MANUFACTURER	Valsir S.p.A., Località Merlaro, Vestone (BS), ITALY.
USE OF PRODUCT	In-Line/Fittings and Pipe System for Hot and Cold Water Applications.
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 and controlled as described in Appendix C, D, E, F, G, H.
PROJECT COMPLETION DATE	02/12/2013
PROJECT COMMENT	The results presented herein demonstrate compliance of Valsir 16 x 16 95° Elbow and PE-X /Al/PE-X Multilayer Pipe to AS/NZS 4020 when tested at the in-the-product exposure (343,348 mm2/L) at 95°C ± 2°C.

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.

M. GLASSON
APPROVED SIGNATORY

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Summary of Results

APPENDIX	RESULTS
C - TASTE OF WATER EXTRACT	Passed when tested at the in-the-product exposure (343,348 mm2/L).
D – APPEARANCE OF WATER EXTRACT	Passed when tested at the in-the-product exposure (343,348 mm2/L).
E - GROWTH OF AQUATIC MICRO-ORGANISMS	Passed when tested at the in-use exposure.
F - CYTOTOXIC ACTIVITY OF WATER EXTRACT	Passed when tested at the in-the-product exposure (343,348 mm2/L).
G - MUTAGENIC ACTIVITY OF WATER EXTRACT	Passed when tested at the in-the-product exposure (343,348 mm2/L).
H – EXTRACTION OF METALS	Passed when tested at the in-the-product exposure (343,348 mm2/L).

Test Methods

Test(s)	AWQC Test Method	Reference Method
C	T0320-1	AS/NZS 4020:2005
D	TO029-01 & TO018-01	APHA 2130b
E	TO014-03	APHA 4500 O C
F	TM-001	AS/NZS 4020:2005
G	TM-002	AS/NZS 4020:2005
H	TIC-006	EPA 200.8

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GPO Box 1751
Adelaide SA 5001

250 Victoria Square
Adelaide SA 5000

Tel: 1300 653 366
Fax: 1300 653 [illegible]96

Internet: www.awqc.com.au
Email: awcc@sawater.com.au

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SUMMARY COMMENT

The sample was initially tested as a complete system of brass elbow, PPSU elbow and pipe assembly with an in-the-product exposure of (343,348 mm2/L).
The sample exceeded the maximum allowable concentration for Lead (Pb) under Appendix H – Extraction of Metals thus the brass elbow was omitted from the system and the remaining PPSU elbow and Pipe Assembly passed when tested at the in-the-product exposure (343,348 mm2/L) at 95°C ± 2°C.

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REPORT ID	128971V
CLAUSE 6.2	**Taste of Water Extract**
SAMPLE DESCRIPTION	The sample consisted of three lengths of pipe and two fittings in an assembly with an internal diameter of 11.65 mm providing an exposure of approximately 343,348 mm2 per Litre. Extracts were prepared using 1000 mL volumes of 50 mg/L hardness water.
EXTRACTION TEMPERATURE	95°C ± 2°C
TEST METHOD	TASTE OF WATER EXTRACT (APPENDIX C)
SCALING FACTOR	Not applicable.
RESULTS	No tastes were detected in the controls or in the test extracts prepared at the in-the-product exposure with chlorinated and chlorine-free water.
EVALUATION	The product passed the requirements of clause 6.2 when tested at the in-the-exposure (343,348 mm2/L).
NUMBER OF SAMPLES	Two samples tested.
TEST COMMENT	Not applicable.

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REPORT ID	128971V
CLAUSE 6.3	**Appearance of Water Extract**
SAMPLE DESCRIPTION	The sample consisted of three lengths of pipe and two fittings in an assembly with an internal diameter of 11.65 mm providing an exposure of approximately 343,348 mm2 per Litre. Extracts were prepared using 1000 mL volumes of 50 mg/L hardness water.
EXTRACTION TEMPERATURE	95°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 the in-the-exposure (343,348 mm2/L).
NUMBER OF SAMPLES	One sample tested.
TEST COMMENT	Not applicable.

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REPORT ID	128971V
CLAUSE 6.4	**Growth of Aquatic Micro-organisms**
SAMPLE DESCRIPTION	The non-metallic components were immersed at the in-use exposure. The surface area of each component was in the range 1000 mm2 per Litre to 15000 mm2 per Litre. Extracts were prepared using 1000 mL volumes of test water.
EXTRACTION TEMPERATURE	30°C ± 2°C
TEST METHOD	GROWTH OF AQUATIC MICRO-ORGANISMS (APPENDIX E)
INOCULUM	The volume of inoculum was 100 mL
SCALING FACTOR	Not applied.

RESULTS

Mean Dissolved Oxygen	Control	7.5 mg/L
Mean Dissolved Oxygen Difference	Positive Reference	5.1 mg/L
	Negative Reference	< 0.1 mg/L
	Test	0.3 mg/L

EVALUATION	The product passed the requirements of Clause 6.4 when tested at the in-use exposure (the surface area of each component was in the range 1000 mm2 per Litre to 15000 mm2 per Litre).
NUMBER OF SAMPLES	One sample tested.
TEST COMMENT	Not applicable.

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Adelaide SA 5001

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Fax: 1300 883 196

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REPORT ID	128971V
CLAUSE 6.5	**Cytotoxic Activity of Water Extract**
SAMPLE DESCRIPTION	The sample consisted of three lengths of pipe and two fittings in an assembly with an internal diameter of 11.65 mm providing an exposure of approximately 343,348 mm2 per Litre. Extracts were prepared using 1000 mL volumes of 50 mg/L hardness water.
EXTRACTION TEMPERATURE	95°C ± 2°C
TEST METHOD	CYTOTOXIC ACTIVITY OF WATER EXTRACT (APPENDIX F)
SCALING FACTOR	Not Applicable.
RESULTS	Non-Cytotoxic.
EVALUATION	The product passed the requirements of clause 6.5 when tested at the in-the-exposure (343,348 mm2/L).
NUMBER OF SAMPLES	One sample tested.
TEST COMMENT	The test extracts and blank extracts were used to prepare nutrient growth medium and subsequently used to grow a cell line (ATCC Number CCL 81) in the analysis. In addition zinc sulphate (0.4 mmol) was used for the positive control in the analysis.

Brendan Kitt

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CLAUSE 6.6 **Mutagenic activity of Water Extract**

SAMPLE DESCRIPTION The sample consisted of three lengths of pipe and two fittings in an assembly with an internal diameter of 11.65 mm providing an exposure of approximately 343,348 mm2 per Litre.

Extracts were prepared using 1000 mL volumes of 50 mg/L hardness water.

EXTRACTION TEMPERATURE 95°C ± 2°C

TEST METHOD MUTAGENIC ACTIVITY OF WATER EXTRACT (APPENDIX G)

SCALING FACTOR Not Applicable.

RESULTS

BACTERIAL STRAIN	S9	Blank	Sample Extract	Positive Controls NPD (20ug)	2-AF (20ug)
Salmonella typhimurium TA98	-	21, 18, 22	33, 23, 23	2516, 2440, 2269	
Mean ± Standard deviation		20.3 ± 2.1	26.3 ± 5.8	2408.8 ± 126.5	
	+	15, 25, 26	29, 28, 28	-	2312, 2289, 2482
Mean ± Standard deviation		22.0 ± 6.1	28.3 ± 0.6	-	2361.0 ± 105.4

				AZIDE (1.0ug)	2-AF (20ug)
Salmonella typhimurium TA100	-	369, 342, 373	345, 344, 354	1044, 1126, 1093	
Mean ± Standard deviation		361.3 ± 16.9	347.7 ± 5.5	1087.7 ± 41.3	
	+	284, 239, 305	244, 249, 263	-	2398, 2408, 2568
Mean ± Standard deviation		276.0 ± 33.7	252.0 ± 9.8	-	2458.0 ± 95.4

				MITOMYCIN C (2ug)
Salmonella typhimurium TA102	-	722, 660, 682	669, 620, 677	2420, 2481, 2357
Mean ± Standard deviation		688.0 ± 31.4	655.3 ± 30.9	2419.3 ± 62.0
	+	566, 464, 663	532, 576, 674	
Mean ± Standard deviation		564.3 ± 99.5	594.0 ± 72.7	

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GPO Box 1751
Adela de SA 5001

250 Victoria Square
Adela.de SA 5000

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Fax 1300 883 196

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CLAUSE 6.6	**Mutagenic activity of Water Extract**
COMMENTS	S9 was used as a metabolic activator. NPD (4-nitro-o-phenylenediamine), Azide, and Mitomycin C are specific positive controls for strains TA 98, TA 100 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 the in-the-exposure (343,348 mm2/L).
NUMBER OF SAMPLES	One sample tested.
TEST COMMENT	Not applicable.

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CLAUSE 6.7	**Extraction of Metals**
SAMPLE DESCRIPTION	The sample consisted of three lengths of pipe and two fittings in an assembly with an internal diameter of 11.65 mm providing an exposure of approximately 343,348 mm2 per Litre. Extracts were prepared using 1000 mL volumes of 50 mg/L hardness water.
EXTRACTION TEMPERATURE	95°C ± 2°C
TEST METHOD	EXTRACTION OF METALS (APPENDIX H)
SCALING FACTOR	Not Applicable.
METHODS 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. Concentrations 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, Selenium and Silver by Inductively Coupled Plasma Mass Spectrometry

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CLAUSE 6.7 **Extraction of Metals**

RESULTS

Final Extract

	Limit of reporting mg/L	Blank mg/L	Test 1 mg/L	Test 2 mg/L	Max. Allowed mg/L
Antimony	0.0005	< 0.0005	< 0.0005	< 0.0005	0.003
Arsenic	0.0003	< 0.0003	< 0.0003	< 0.0003	0.007
Barium	0.0005	< 0.0005	< 0.0005	< 0.0005	0.7
Cadmium	0.0001	< 0.0001	< 0.0001	< 0.0001	0.002
Chromium	0.0001	< 0.0001	< 0.0001	< 0.0001	0.05
Copper	0.0001	< 0.0001	< 0.0001	< 0.0001	2.0
Lead	0.0001	< 0.0001	< 0.0001	< 0.0001	0.01
Mercury	0.00003	< 0.00003	< 0.00003	< 0.00003	0.001
Molybdenum	0.0001	< 0.0001	< 0.0001	< 0.0001	0.05
Nickel	0.0001	< 0.0001	< 0.0001	< 0.0001	0.02
Selenium	0.0001	< 0.0001	< 0.0001	< 0.0001	0.01
Silver	0.00003	< 0.00003	< 0.00003	< 0.00003	0.1

EVALUATION The product passed the requirements of clause 6.7 when tested at the in-the-exposure (343,348 mm2/L).

NUMBER OF SAMPLES One sample - two extracts.

TEST COMMENT The sample initially tested consisted of three lengths of pipe and two fittings (one brass and one PPSU) in an assembly with an internal diameter of 11.65 mm providing an exposure of approximately 343,348 mm2 per Litre. The sample extracts derived from this assembly exceeded the maximum allowable concentration for Lead (Pb).

The test was repeated whereby the brass elbow was omitted from the system and the PPSU elbow and pipe assembly passed at the in-the-exposure (343,348 mm2/L).

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END OF REPORT

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