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AS/NZS 4020:2005 Compliance Testing

Certificate of Analysis

(Supersedes all interim reporting)

Dated: 07/08/08

CUSTOMER: COES S.p.A
Via Genova 13
I-20196 Pioltello (MI)
Italy

OUR REF: 0806079

ATTN: Stefano Richetti

DATE RECEIVED: 27/05/08

INTERIM REPORTING: 17/06/08
(email) 07/08/08

DATE COMMENCED: 30/05/08

DATE COMPLETED: 07/08/08

1. SAMPLES FOR TESTING:

*** Description:**

COESTHERM- HEXA PP-RCT Multilayer Pipe;

Polypropylene, DN: 16mm, ID: 10mm
Date of Manufacture: 20/02/08 ore 12.15
Print on Pipe: "COESTHERM HEXA Multilayer Pipe PP-RCT/PP-RCT/PP-R Made in Italy 16x2.2 PN20 SDR 7.4 – DIN8077/8078 20/02/08 12:12:12 etc"

Product range: DN16 – DN200

Volume retention of ~1m pipe: 107mL

*** Testing Procedure / Background Information:**

Testing is based on the recommended 'in-the-product' exposure of ~400,000mm² HEXA PP-RCT pipe / L test water at ~20°C to cover a cold water application up to <40°C.

The pipe with inner diameter of ~10mm (OD: 16mm) is selected to cover the worst case scenario. i.e. highest surface area-to-volume ratio.

*** Product Use:**

In-Line

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.: 0806079
Submitting Organisation: COES S.p.A	
Product: COESTHERM- HEXA PP-RCT Multilayer Pipe; Polypropylene, DN: 16mm, ID: 10mm	Date of Report: 07/08/08

- * **General Composition:** Polypropylene pipe
(including type of wetted materials and supplier/manufacturers)
- * **Trade Name and Reference of Product:** COESTHERM- HEXA PP-RCT Multilayer Pipe
- * **Product Manufacturer:** COES S.p.A
- * **Place of Manufacture:** Via Genova 13
I-20196 Pioltello (MI)
Italy
- * **Submitting Organisation:** COES S.p.A
- * **Sampling Organisation:** COES S.p.A
- * **Type of certification:** StandardsMark (Type 1)
- * **Certifying Body:** SAI Global Assurance Services
(including contact person and mailing address)
John Prasad
GPO Box 5420
Sydney, NSW 2001
- * **Temperature range:** (0- 90)°C

* Based on product submission information supplied by customer.

2. **TESTS REQUIRED:**

- Taste of Water Extract, *Appendix C*
- Appearance of Water Extract, *Appendix D*
- Growth of Aquatic Micro-organisms, *Appendix E*
- Cytotoxic Activity of Water Extract, *Appendix F*
- Mutagenic Activity of Water Extract, *Appendix G*
- Extraction of Metals, *Appendix H*

Method: TMP-191100

Reference: AS/NZS 4020:2005, Testing of products for use in contact with drinking water

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3. TASTE OF WATER EXTRACT:

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

Extraction temperature: (20 ± 2)°C

Exposure: 'in-the-product'; ~400,000mm² HEXA PP-RCT pipe / L test water

No. of samples tested: 8 x ~1m length pipes;
4 for chlorine free test extract & 4 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	6	-	NA	NA
SAMPLE EXTRACT Final 9-day:	Chlorine-free	6	-	NA	NA
TEST BLANK Final 9-day:	Chlorinated	6	-	NA	NA
SAMPLE EXTRACT Final 9-day:	Chlorinated	6	+	woody (1)	1/2 (almost slight)

+ 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 the test requirements of AS/NZS 4020:2005, Taste of Water Extract; *Appendix C*, at the recommended 'in-the-product' exposure of ~400,000mm² HEXA PP-RCT pipe / L test water at ~20°C to cover a cold water application up to <40°C.

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4. 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: 'in-the-product'; ~400,000mm² HEXA PP-RCT pipe / L test water

No. of samples tested: 6 x ~1m length pipes

Following test extractions, the first 24h composite test extract of 6 x ~1m length pipes was prepared & used for assaying.

	a) TRUE COLOUR: Hazen Units (HU)	b) TURBIDITY: Nephelometric Turbidity Units (NTU)
	First 24h Extract	First 24h Extract
Sample Extract pH = 8.83	<2	0.12
Test Blank pH = 8.65	<2	0.11
FINAL RESULT	<2	0.01
AS/NZS 4020 Test sample requirements	≤5	≤0.5

< = less than

≤ = 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. RN683782.

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 'in-the-product' exposure of ~400,000mm² HEXA PP-RCT pipe / L test water at ~20°C to cover a cold water application up to <40°C.

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5. 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'; ~16,500mm² HEXA PP-RCT pipe / 1.1L test water
i.e. ~15,000mm² HEXA PP-RCT pipe / L test water

No. of samples tested: ~16,500mm² HEXA PP-RCT pipe / 1.1L test water

Inoculum: 110mL for 1.1L

Jar Size: Calibrated for 1.1L 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)	5.25
TEST BLANK	6.67 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 HEXA PP-RCT pipe / L test water at ~30°C.

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6. CYTOTOXIC ACTIVITY OF WATER EXTRACT:

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

Extraction temperature: (20 ± 2)°C

Exposure: 'in-the-product'; ~400,000mm² HEXA PP-RCT pipe / L test water

No. of samples tested: 1 x ~1m length pipe

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 'in-the-product' exposure of ~400,000mm² HEXA PP-RCT pipe / L test water at ~20°C to cover a cold water application up to <40°C.

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7. MUTAGENIC ACTIVITY OF WATER EXTRACT:

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

Extraction temperature: (20 ± 2)°C

Exposure: 'in-the-product'; ~400,000mm² HEXA PP-RCT pipe / L test water

No. of samples tested: 1 x ~1m length pipe

The results for the first 24h test extract are given below:

BACTERIAL STRAIN: <i>Salmonella typhimurium</i>	* S9 -No +With	a) TRIPLICATES (REVERTANTS/PLATES) b) MEAN + STANDARD DEVIATION			
		TEST BLANK (Extractant Water)	SAMPLE EXTRACT (Leachate)	Negative Control (Test culture only)	Positive Control (Standard diagnostic mutagen)
TA 98	-	a)	a)	a)	a)
		38 48 40	38 26 31	38 38 23	I 159 145 177
TA 98	+	b)	b)	b)	b)
		42 ± 5	32 ± 6	33 ± 9	160 ± 16
TA 98	+	a)	a)	a)	a)
		50 31 52	57 40 42	54 56 54	IV 2,030 2,160 2,130
TA 100	-	b)	b)	b)	b)
		44 ± 12	46 ± 9	55 ± 1	2,107 ± 68
TA 100	-	a)	a)	a)	a)
		263 228 208	276 268 266	256 250 266	II 6,944 6,784 6,144
TA 100	-	b)	b)	b)	b)
		233 ± 28	270 ± 5	257 ± 8	6,624 ± 423

* 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) TRIPPLICATES (REVERTANTS/PLATES) b) MEAN + STANDARD DEVIATION			
		TEST BLANK (Extractant Water)	SAMPLE EXTRACT (Leachate)	Negative Control (Test culture only)	Positive Control (Standard diagnostic mutagen)
TA 100	+	a)	a)	a)	a)
		216 214 173	199 184 131	208 215 252	III 5,910 6,400 6,010
		b)	b)	b)	b)
		201 ± 24	171 ± 36	225 ± 24	6,107 ± 259
TA 102	-	a)	a)	a)	a)
		497 547 456	467 466 438	559 489 554	I 821 807 661
		b)	b)	b)	b)
		500 ± 46	457 ± 16	534 ± 39	763 ± 89
TA 102	+	a)	a)	a)	a)
		563 472 448	566 503 506	509 505 499	III 666 700 690
		b)	b)	b)	b)
		494 ± 61	525 ± 36	504 ± 5	685 ± 17

* Metabolic Activator

NA=Not applicable

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 'in-the-product' exposure of ~400,000mm² HEXA PP-RCT pipe / L test water at ~20°C to cover a cold water application up to <40°C.

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8. EXTRACTION OF METALS:

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

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

Exposure: 'in-the-product'; ~400,000mm² HEXA PP-RCT pipe / L test water

No. of samples tested: 6 x ~1m length pipes

Following test extractions, the first 24h composite test extract of 6 x ~1m length pipes was prepared and used for assaying. The results obtained are given below:

Element	In-House Method	AS/NZS 4020: Maximum Allowable Concentration mg/L (ppm)	Limit of Reporting mg/L (ppm)	Sample Extract mg/L (ppm)	Test Blank mg/L (ppm)	FINAL RESULT mg/L (ppm)
antimony ¹ (Sb)	NT2_47	0.003	0.001	<0.001	<0.001	<0.001
arsenic ² (As)	NT247_251	0.007	0.001	<0.001	<0.001	<0.001
barium ¹ (Ba)	NT2_47	0.7	0.001	0.0077	<0.001	0.0077
cadmium ¹ (Cd)	NT2_47	0.002	0.001	<0.001	<0.001	<0.001
chromium ¹ (Cr)	NT2_47	0.05	0.001	<0.001	<0.001	<0.001
copper ¹ (Cu)	NT2_47	2	0.001	<0.001	<0.001	<0.001
lead ¹ (Pb)	NT2_47	0.01	0.001	<0.001	<0.001	<0.001
mercury ³ (Hg)	NT2_47_244	0.001	0.0001	<0.0001	<0.0001	<0.0001
molybdenum ¹ (Mo)	NT2_47	0.05	0.001	<0.001	<0.001	<0.001
nickel ¹ (Ni)	NT2_47	0.02	0.001	<0.001	<0.001	<0.001
selenium ² (Se)	NT247_251	0.01	0.001	<0.001	<0.001	<0.001
silver ¹ (Ag)	NT2_47	0.1	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. RN683783.

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 'in-the-product' exposure of ~400,000mm² HEXA PP-RCT pipe / L test water at ~20°C to cover a cold water application up to <40°C.

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**9. SUMMARY: COESTHERM- HEXA PP-RCT Multilayer Pipe;
Polypropylene, DN: 16mm, ID: 10mm**

AS/NZS 4020:2005 TESTS	RESULTS
a) TASTE - <i>Appendix C</i>	PASS at testing exposure
b) APPEARANCE - <i>Appendix D</i> i) Colour ii) Turbidity	i) PASS at testing exposure ii) PASS at testing exposure
c) GROWTH OF AQUATIC MICRO-ORGANISMS - <i>Appendix E</i>	PASS at testing exposure
d) CYTOTOXIC ACTIVITY - <i>Appendix F</i>	PASS at testing exposure
e) MUTAGENIC ACTIVITY - <i>Appendix G</i>	PASS at testing exposure
f) EXTRACTION OF METALS - <i>Appendix H</i>	PASS at testing exposure

Note: All tests are based on a cold water application up to 40°C with testing at the recommended 'in-the-product' exposure of $\sim 400,000\text{mm}^2$ HEXA PP-RCT pipe / L test water at $(20 \pm 2)^{\circ}\text{C}$, except Test c). Test c) Growth of Aquatic Micro-organisms, is based on a 'total immersion' exposure of $\sim 15,000\text{mm}^2$ HEXA PP-RCT pipe / L test water at $(30 \pm 1)^{\circ}\text{C}$.

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10. CONCLUSIONS:

The product, **COESTHERM- HEXA PP-RCT Multilayer Pipe; Polypropylene, DN: 16mm, ID: 10mm**, referred to in this report, has been tested in accordance to AS/NZS 4020:2005, Testing of products for use in contact with drinking water for:


- Taste of Water Extract, *Appendix C*
- Appearance of Water Extract, *Appendix D*
- Growth of Aquatic Micro-organisms, *Appendix E*
- Cytotoxic Activity of Water Extract, *Appendix F*
- Mutagenic Activity of Water Extract, *Appendix G*
- Extraction of Metals, *Appendix H*

Based on completion and evaluation of all tests on **07/08/08**, the product, **COESTHERM- HEXA PP-RCT Multilayer Pipe; Polypropylene, DN: 16mm, ID: 10mm**; **fully** complies with the test requirements of AS/NZS 4020:2005 to cover a cold water application up to 40°C, at the recommended 'in-the-product' exposure of ~400,000mm² HEXA PP-RCT pipe / L test water at $(20 \pm 2)^{\circ}\text{C}$. This testing exposure covers the product range with lower or equivalent wetted surface area.

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.

Our reports are recognised by regulatory bodies such as SAI Global Assurance Services, Global Mark, ISC, AGA and IAPMO qualified for product certification to AS/NZS 4020 compliance testing, as well as for the purpose of WELS registration by WELS Product Registrations, Standards and Compliance.

Signed: _____



SANDHYA L. SINGH B. Tech, Postgrad. Dip. (Chem)
Manager, Chemistry and Toxicology; Approved Signatory

Date: _____

07/08/08