

WATER REGULATIONS ADVISORY SCHEME (WRAS).

**TESTING OF NON-METALLIC MATERIALS FOR USE WITH DRINKING
WATER (BS 6920 : 2000)**

TEST REPORT

Product : Corro-Coat EP-F 1003LD
Report Reference : M 104521
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Jotun Powder Coatings (N) A/S
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Larvik
NORWAY

Report Date : 17th June 2009

Executive Summary - this product has met the requirements of the Water Regulations Advisory Scheme (WRAS) Tests of Effect on Water Quality/BS 6920:2000 /Hot and Cold Water Use.

NOTES.

1. The results given in this report relate only to the items tested, and not necessarily to the bulk from which they were taken.
2. This test work was undertaken in the UKAS accredited Spencer House laboratory of Thames Water Utilities Ltd., UKAS registration number 0677, unless otherwise stated.
3. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.
4. This test report shall not be reproduced, except in full, without our prior written approval.

**TESTING OF NON-METALLIC MATERIALS FOR USE WITH DRINKING WATER.
WATER REGULATIONS ADVISORY SCHEME TESTS OF EFFECT ON WATER
QUALITY (BS 6920:2000).**

0. INTRODUCTION.

The samples of the product referred to in this report have been tested in accordance with the methods of the Water Regulations Advisory Scheme (WRAS) Tests of Effect on Water Quality/BS 6920-2:2000 "Suitability of non-metallic products for use in contact with water intended for human consumption with regard to their effect on the quality of the water : Methods of Test".

1. TEST SAMPLES.

General composition of product	Fusion Bonded Epoxy Factory Applied Coating	
Trade name/designation	Corro-Coat EP-F 1003LD	
Material manufacturer	Jotun Powder Coatings (N) A/S	
Date of manufacture/production	10 th November 2008	
Production batch numbers	36002 01-001	
Submitting organisation	Jotun Powder Coatings (N) A/S	
Date of receipt of test samples	14 th April 2009	
Method of packaging	In plastic bag	
Condition on receipt	Satisfactory	
Laboratory storage before test	Ambient temperature (21±4)°C	
Description	test article shape dimensions	Coated stainless steel panel Rectangular 123mm x 61mm x 2mm
Appearance of article	colour surface finish opacity	Beige Matt Opaque
Surface area of one article (mm ²)	15742	
Number of articles to give a surface area of 15000mm ²	1	
Calibration mark of the test vessel/container in litres	1	
Extraction temperature used for tests 2, 3, 5 & 6	(85±2)°C	

6. EXTRACTION OF METALS.

Temperature of extraction : (85±2)°C

Date test started : 21.04.09

The results obtained for the first extract are given below -

Element	Unit	MAC	Reporting limit	Sample 1	Sample 2	Reagent blank
Aluminium 7 th Extract	Al $\mu\text{g/L}$	200	6.5	284.9 13.1	241.1 8.6	<6.5 <6.5
Antimony	Sb $\mu\text{g/L}$	5	0.2	<0.2	<0.2	<0.2
Arsenic	As $\mu\text{g/L}$	10	0.3	<0.3	<0.3	<0.3
Barium 7 th Extract	Ba $\mu\text{g/L}$	1000	1.3	1220.7 92.0	1416.2 113.8	<1.3 <1.3
Cadmium	Cd $\mu\text{g/L}$	5	0.2	<0.2	<0.2	<0.2
Chromium	Cr $\mu\text{g/L}$	50	1.4	<1.4	<1.4	<1.4
Iron	Fe $\mu\text{g/L}$	200	1.0	6.2	3.9	<1.0
Lead	Pb $\mu\text{g/L}$	25	0.3	0.5	<0.3	<0.3
Manganese	Mn $\mu\text{g/L}$	50	1.5	<1.5	<1.5	<1.5
Mercury	Hg $\mu\text{g/L}$	1	0.12	<0.12	<0.12	<0.12
Nickel	Ni $\mu\text{g/L}$	20	1.6	<1.6	<1.6	<1.6
Selenium	Se $\mu\text{g/L}$	10	0.8	<0.8	<0.8	<0.8

Extract Analytical.

Aluminium, antimony, arsenic, barium, cadmium, chromium, iron, lead, manganese, mercury, nickel, and selenium - inductively coupled plasma mass spectrometry or inductively coupled plasma optical emission spectrometry [method code 563].

Analytical Control Data - this technique is in continuous use for analysis of drinking water metals; this technique is fully validated to the requirements of "A Manual on Analytical Quality Control for the Water Industry" (NS 30) and the requirements laid down by the Drinking Water Inspectorate. The technique has a comprehensive AQC protocol including control solutions and spike recovery testing with each batch of samples for analysis; full details available upon request.

COMMENT. On the basis of these results the samples of this product have been found **to conform** with the requirements of BS 6920-1 : Clause 8 when extracted at 85°C.

CONCLUSIONS.

The samples of this product meet the test criteria of BS 6920-1:2000 ("Specification") and thus DO conform with the requirements of the Water Regulations Advisory Scheme (WRAS) Tests of Effect on Water Quality, and is suitable for use with hot (up to 85°C) and cold water.

NOTE : materials and products intended for use by a public water supply company in the preparation or conveyance of water may need to satisfy more comprehensive toxicological requirements as specified by the Drinking Water Inspectorate. These additional requirements are necessary to ensure water company usage complies with Regulation 31 of the Water Supply (Water Quality) Regulations 2000.

NOTES -

1. The results specified in this report relate only to the sample(s) submitted for testing. Any changes in the nature or source of ingredients and the process of manufacture or application could affect the suitability of this product for use in contact with drinking water.
2. We would draw to your attention that reports issued by the accredited test laboratories do not of themselves constitute approval by the Water Regulations Advisory Scheme (WRAS) or the test laboratory. Only a letter from the Scheme, citing a Directory Reference Number, can be regarded as indicating approval.



Helen Bala
Materials Testing Manager

WATER REGULATIONS ADVISORY SCHEME (WRAS) TESTS OF EFFECT ON WATER QUALITY : TEST CRITERIA (BS 6920:2000).

The following test criteria are used to determine whether your product(s) complies with the requirements of the Water Regulations Advisory Scheme (WRAS) Tests of Effect on Water Quality.

1. ODOUR & FLAVOUR OF WATER. (BS 6920-1 : Clause 4)

Off-odours and off-flavours of water are the most usual causes of customer complaints about water quality. On test the material is exposed, under controlled conditions (surface area to volume (S/V) test ratio, duration, temperature) to the test water (with and without free-chlorine); it is subsequently diluted twice on a 1 to 1 basis and assessed by a test panel.

The test sample leachates must be free from odour and, after dilution, free from flavour in the first 1:1 dilutions of them. If, after 7 sequential leaching periods, any odour is detected in the sample leachates or any flavour detected in the first dilution of these leachates by any of the three panellists, then the product fails to meet this test criterion *unless* two further sets of test samples are assessed and no odour is reported in the leachates and no flavour is reported in the first dilutions of the final (i.e. seventh) leachates from these additional test samples.

Materials meeting these test criteria do not usually give rise to off-odours and off-flavours in-service.

2. APPEARANCE OF WATER. (BS 6920-1 : Clause 5)

Any increase in the colour and turbidity of the final (i.e. seventh) leachate from the sample of the product must be less than 5 Hazen units and 0.5 FNU respectively. If any colour or turbidity is detected in the final extract, then the product fails to meet the test criteria *unless* two further samples are tested and the mean of the colour and turbidity measurements of the final extracts of *all* of the samples meet the test criteria.

Materials meeting these test criteria do not usually give rise to in-service changes in the appearance of water.

3. GROWTH OF AQUATIC MICROORGANISMS. (BS 6920-1 : Clause 6)

The original methods were based on microbiological counting techniques and the test took a longer time period and cost considerably more (in real terms) than the present test. In an attempt to improve the performance of the test, including duration, other techniques were evaluated for assessing materials for the supports of biofilms and overall growth in water.

Work using dissolved oxygen depletion measurements as a surrogate measure of microbial growth in water showed improved reproducibility and repeatability compared with bacterial counts. The mean dissolved oxygen difference (MDOD) value obtained for the product is a surrogate measure of its ability to support the growth of microorganisms - as the growth of the organisms increases oxygen is removed from the test system; thus the greater the loss of dissolved oxygen caused by the product, the greater the MDOD value. This work was subsequently published (Colbourne and Brown, 1979) and incorporated into BS 6920 : Section 2.4:1988.

The mean dissolved oxygen difference between the water in contact with the sample of the product and the negative control system must be less than 2.4 mg/l; two further test samples of products giving a value in the range 1.7 to 2.9 mg/L are tested and the mean of the three readings used to show conformity with the test requirement $s(<2.4 \text{ mg/l})$.

The pass/fail criterion was set after consideration of results obtained from materials using microbial counts and evaluation of materials associated with biofilm development and/or microbial deterioration in water quality in-service.

4. THE EXTRACTION OF SUBSTANCES.... (CYTOTOXICITY TEST) (BS 6920-1 : Clause 7)

If the first aqueous extract from the sample of the product is free from toxicity to the test cell line, it can be regarded as suitable for use in contact with potable water in relation to this particular test. If any toxicity is detected in this extract, then the product fails to meet the test criteria *unless* two further samples are tested and found to be free from any toxic response.

A failure in this test is indicative only of a possible public health issue and NOT necessarily of a real concern.

5. THE EXTRACTION OF METALS. (BS 6920-1 : Clause 8)

Any metal present in the final duplicate extracts obtained from the samples of the product must be at levels less than Maximum Admissible Levels (MACs) based on both the first and subsequent EU Drinking Water Directives. If the MACs of any metal is exceeded in either of the final extracts from the samples of the product then the product fails to meet this test criterion *unless* three further samples of the product are tested and the levels of the specified metals in the extracts from all of these additional samples do not exceed the MACs.

Materials meeting these test criteria do not usually give rise to significant in-service changes in the concentrations of metals in water.