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Boeing BSS 7239 Toxic Gas Generation of "OXIFREE TM198"

A Report To: **Oxifree Global LLC**
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Attention: Ed Hall

Submitted By: Fire Testing

Report No. 12-002-080(B)
3 pages + appendix

Date: February 16, 2012

ACCREDITATION To ISO/IEC 17025 for a defined Scope of Testing by the International Accreditation Service

SPECIFICATIONS OF ORDER

Determine toxic gas production according to Boeing BSS 7239, as per your Purchase Order No. 0110250 dated February 12, 2012.

IDENTIFICATION

Protective organic coating material, approximately 12 mm in thickness and identified as "Oxifree TM198".

(Exova sample identification number 12-002-S0059)

TEST RESULTS

Boeing BSS 7239 (Rev.: A 1-18-88)

Toxic Gas Generation

		<u>Toxic Gas Generation</u>		M-7 Technical
		<u>Flaming Mode</u>	<u>Non-Flaming Mode</u>	<u>Specification Maxima</u>
Carbon Monoxide (CO ppm)	at 1.5 minutes	15	<10	-
	at 4.0 minutes	168	<10	-
	at maximum	758	38	3500
Nitrogen Oxides (as NO2 ppm)		<1	<1	100
Sulfur Dioxide (SO2 ppm)		<6	<6	100
Hydrogen Chloride (HCl ppm)		<12	<12	500
Hydrogen Fluoride (HF ppm)		<12	<12	200
Hydrogen Bromide (HBr ppm)		<3	<3	-
Hydrogen Cyanide (HCN ppm)		<1	<1	150

TEST RESULTS (continued)**Boeing BSS 7239 (Rev.: A 1-18-88)**Toxic Gas Generation

	Flaming <u>Mode</u>	Non-Flaming <u>Mode</u>	M-7 Technical Specification <u>Maxima</u>
Original Weight (g)	133.7	132.5	-
Final Weight (g)	<u>121.1</u>	<u>128.5</u>	-
Weight Loss (g)	12.5	4.0	-
Weight Loss (%)	9.37	3.03	-
Time to Ignition (s)	10	Did not ignite	-
Burning Duration (s)	Not determinable	-	-

CONCLUSIONS AND COMMENTS

Boeing BSS 7239 is solely a test procedure and as such, has no specific pass/fail criteria of its own. The M-7 Technical Specification criteria cited are typical for the transportation industry and are listed for reference purposes only. They may or may not apply to this specific product.

The coating material identified in this report, when tested at an approximate thickness of 12 mm, would meet the M-7 Technical Specification requirements as they pertain to toxic gas generation (Boeing BSS 7239).

Note: This is an electronic copy of the report. Signatures are on file with the original report.

Mel Garces,
Fire Testing.

Ian Smith,
Fire Testing.

Note: This report and service are covered under Exova Canada Inc. Standard Terms and Conditions of Contract which may be found on the Exova website (www.exova.com), or by calling 1-866-263-9268.

APPENDIX

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Summary of Test Procedure

Boeing BSS 7239 (Rev.: A 1-18-88)
Toxic Gas Sampling and Analytical Procedures

Toxic Gas Generation

Gases produced for analysis are generated in a specified, calibrated smoke chamber during standard rate of smoke generation testing (ASTM E 662), in both flaming combustion and non-flaming pyrolytic decomposition test modes.

Carbon Monoxide (CO)

CO is monitored continuously during the 20 minute test using a non-dispersive infrared (NDIR) analyzer. Data are reported in ppm by volume at 1.5 and 4.0 minutes and at maximum concentrations.

Acid Gas Sampling

HCN, HF, HCl, HBr, NO_x and SO₂ are sampled by drawing 1 litre of the chamber atmosphere through two midjet impingers, each containing 10 ml of 0.25N NaOH, at a rate of 400 ml per minute. The 2½ minute sampling period is commenced at the 4 minute mark. Determinations are performed in both the flaming and non-flaming modes and data are reported in parts per million (ppm) by volume in air.

Analysis of Impingers for Hydrogen Cyanide (HCN)

Cyanide in the NaOH impinger, as NaCN, is converted to CNCl by reaction with chloramine-T at pH greater than 8 without hydrolyzing to CNO⁻. After the reaction is complete, CNCl forms a red-blue colour on addition of a pyridine-barbituric acid reagent. Cyanide is quantified by spectrometric measurement of the increase in colour 578 nm.

Reference: In-house SOP 00-13-SP-1216 based on ASTM Method D 2036-91

Analysis of Impingers for Hydrogen Fluoride (HF)

Fluoride, as NaF, in the NaOH impinger is determined using SPADNS colorimetry.

Reference: In-house SOP 01-13-SP-1295

Analysis of Impingers for Hydrogen Chloride (HCl) and Hydrogen Bromide (HBr)

Alkali halides (chloride and bromide) formed in the NaOH solution are measured using ion chromatography with conductivity detection.

Reference: In-house SOP 02-13-SP-1402

Analysis of Impingers for Nitrogen Oxides (NO_x)

Nitrite and nitrate formed in the alkaline solution are determined using ion chromatography with conductivity detection. The nitrite and nitrate results are combined and the total expressed as nitrogen dioxide (NO₂).

Reference: In-house SOP 02-13-SP-1402

Analysis of Impingers for Sulfur Dioxide (SO₂)

SO₂ is trapped in the NaOH impinger as sulfite and sulfate (SO₃⁻² and SO₄⁻²). Hydrogen peroxide is added to convert SO₃⁻² to SO₄⁻². Resulting sulfate is determined using ion chromatography with conductivity detection.

Reference: In-house SOP 02-13-SP-1402