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Bombardier SMP 800-C Toxic Gas Generation of "EPDM 35 FST"

A Report To:	**Caoutchouc Pro-Flex Inc.** 212 des Alouettes St-Alphonse de Granby, QC, Canada J0E 2A0
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Report No.	19-002-581(E) 3 Pages + Appendix
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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 Bombardier SMP 800-C, as per Pro-Flex Inc. reference Purchase Order No. AC-006204 and Element Quotation No. 18-002-580,964 accepted August 6, 2019.

SAMPLE IDENTIFICATION

Rubber compound, identified as:
"EPDM 35 FST"

(Element sample identification number 19-002-S0581)

SUMMARY OF TEST PROCEDURE

Specimens are exposed to the combustion conditions described in ASTM E 662 - *Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials.* Testing is performed in each of the flaming and non-flaming modes. For each mode, an established volume of the smoke generated by those tests is then sampled (drawn) from the chamber at specific flow rates, through infrared analyzers (for carbon monoxide and carbon dioxide), and through liquid chemical impingers designed to trap the other target gas species. These specifc gases are recognized as the primary toxicants and irritants that can be found in the products of combustion for many material fires. Each impinger solution is then further analyzed using an ion chromatograph, or other appropriate analytical techniques, in order to determine the concentration of each of the targeted gas species that occurred in the sampled volume of gas. Results are then compared for acceptance against established threshold or critical concentration criteria for each species.

TEST RESULTS

Bombardier SMP 800-C Rev. 6 (2009-08-31)

Toxic Gas Generation

Carbon Monoxide (CO ppm)	Flaming Mode	Non-Flaming Mode	Specified Maxima	Result
at 1.5 minutes:	<1	<1	-	-
at 4.0 minutes:	<1	<1	-	-
at maximum:	82	514	3500	Pass

Carbon Dioxide (CO_2 ppm)	Flaming Mode	Non-Flaming Mode	Specified Maxima	Result
at 1.5 minutes:	<10	70	-	-
at 4.0 minutes:	136	79	-	-
at maximum:	2239	974	90000	Pass

TEST RESULTS (continued)

Bombardier SMP 800-C Rev. 6 (2009-08-31)

Toxic Gas Generation

Other Gases Sampled	Flaming Mode	Non-Flaming Mode	Specified Maxima	Result
Nitrogen Oxides (as NO_2 ppm)	10	<1	100	Pass
Sulfur Dioxide (SO_2 ppm)	61	10	100	Pass
Hydrogen Chloride (HCl ppm)	2	8	500	Pass
Hydrogen Fluoride (HF ppm)	<2	<2	100	Pass
Hydrogen Bromide (HBr ppm)	<1	<1	100	Pass
Hydrogen Cyanide (HCN ppm)	1	<1	100	Pass

Additional Information	Flaming Mode	Non-Flaming Mode	Specified Maxima	Result
Original Weight (g)	108.19	113.12	-	-
Final Weight (g)	88.43	103.77	-	-
Weight Loss (g)	19.76	9.35	-	-
Weight Loss (%)	18.3	8.3	-	-

Time to Ignition (s)	30	Did not ignite	-	-
Burning Duration (s)	Not determinable	-	-	-

CONCLUSIONS

The rubber compound identified in this report, meets Bombardier requirements as they pertain to toxic gas production (Bombardier SMP 800-C).

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

Mel Garces,
Senior Technologist.

Ian Smith,
Technical Manager.

APPENDIX

(1 Page)

Methods of Analysis

Bombardier SMP 800-C Rev. 6 (2009-08-31)

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 (typically ASTM E 662), in both flaming combustion and non-flaming pyrolytic decomposition test modes.

Carbon Monoxide (CO) and Carbon Dioxide (CO_2)

CO and CO_2 are 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 concentration.

Acid Gas Sampling

HCN, HF, HCl, HBr, NO_X and SO_2 are sampled by drawing 6 litres of the chamber atmosphere through two midget impingers, each containing 10 ml of 0.25N NaOH, at a rate of 375 ml per minute. The 16 minute sampling period is commenced at the 4 minute mark. All determinations are performed in both the flaming and non-flaming modes and all 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^-. Afterthe 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 and 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 and conductivity detection. The nitrite and nitrite results are combined and the total expressed as nitrogen dioxide (NO_2).

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

Analysis of Impingers for Sulfur Dioxide (SO_2)

SO_2 is trapped in the NaOH impinger as sulfite and sulfate (SO_3^{-2} and SO_4^{-2}). Hydrogen peroxide is added to convert SO_3^{-2} to SO_4^{-2}. Resulting sulfate is determined using ion chromatography and conductivity detection. Reference: In-house SOP 02-13-SP-1402