

## Rate of Smoke and Toxic Gas Generation of "Elmosoft" Leather

A Report To: **Blackstock Leather Inc.**  
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Attention: Mark Hodder

Submitted By: Fire Testing

Report No. 05-02-631  
4 pages + 1 appendix

Date: September 20, 2005

**ACCREDITATION** Standards Council of Canada, Registration #1.

**REGISTRATION** ISO 9001:2000, registered by QMI, Registration #001109.

**SPECIFICATIONS OF ORDER**

Determine rate of smoke generation according to ASTM E 662 and toxic gas production according to Bombardier SMP 800-C, as per your P.O. #81105 dated August 11, 2005.

**IDENTIFICATION**

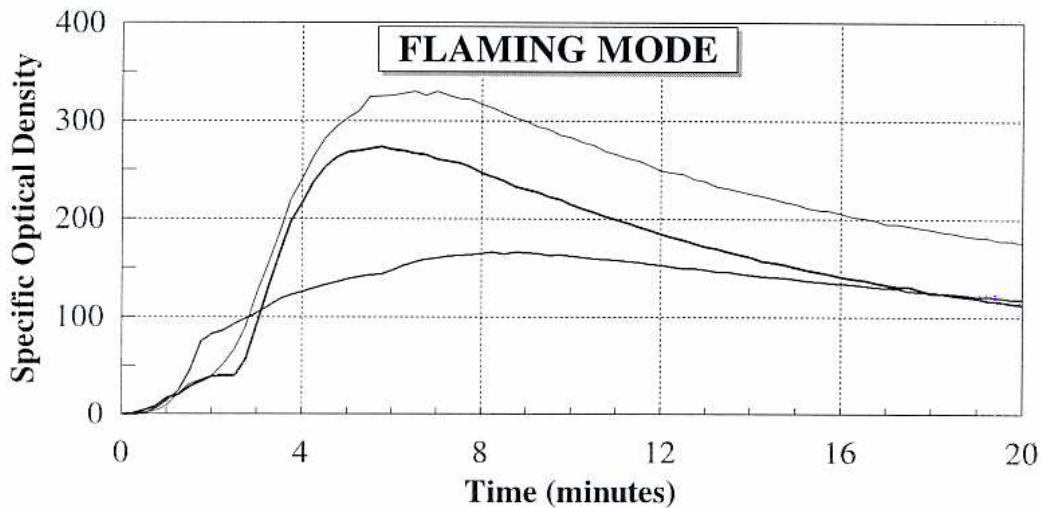
Leather, approximately 1.5 mm in thickness, identified as "Elmosoft VI".

(BMTc sample identification number 05-02-S0631)

**TEST RESULTS**

**ASTM E 662-03e1**

Specific Optical Density of Smoke Generated by Solid Materials

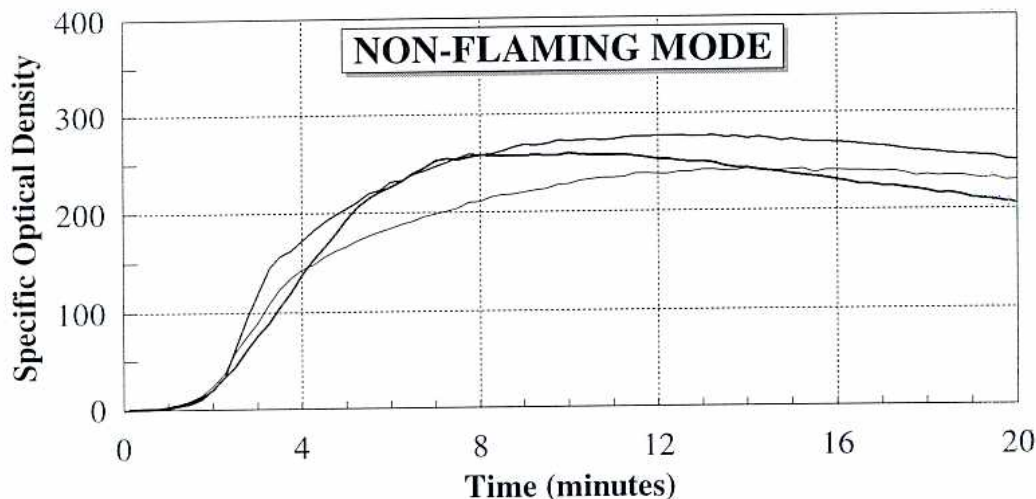


Flaming Mode	Test	#1	#2	#3	Average	Specified Maxima
Specific Optical Density at 1.5 minutes		28	46	31	35	-
Specific Optical Density at 4.0 minutes		216	127	240	194	200
Maximum Specific Optical Density		274	166	329	256	-
Maximum Corrected Optical Density		266	159	321	249	-

**TEST RESULTS (Cont..)**

**ASTM E 662-03e1**

Specific Optical Density of Smoke Generated by Solid Materials



Non-Flaming Mode	Test	#1	#2	#3	Average	Specified Maxima
Specific Optical Density at 1.5 minutes		6	9	9	8	-
Specific Optical Density at 4.0 minutes		138	172	142	151	200
Maximum Specific Optical Density		260	278	242	260	-
Maximum Corrected Optical Density		255	270	228	251	-

**Bombardier SMP 800-C**

Toxic Gas Generation

	Flaming Mode	Non-Flaming Mode	Specified Maxima
Carbon Monoxide (CO ppm)			
at 1.5 minutes	<10	<10	-
at 4.0 minutes	38	<10	-
at maximum	703	<10	3500
Carbon Dioxide (CO2 ppm)			
at 1.5 minutes	550	<50	-
at 4.0 minutes	3700	<50	-
at maximum	17600	<50	90000

**TEST RESULTS (Cont..)**

**Bombardier SMP 800-C**


Toxic Gas Generation


	<u>Flaming Mode</u>	<u>Non-Flaming Mode</u>	<u>Specified Maxima</u>
Nitrogen Oxides (as NO2 ppm)	7	3	100
Sulphur Dioxide (SO2 ppm)	28	7	100
Hydrogen Chloride (HCl ppm)	6	9	500
Hydrogen Fluoride (HF ppm)	<2	<2	100
Hydrogen Bromide (HBr ppm)	<1	<1	100
Hydrogen Cyanide (HCN ppm)	54	27	100
Original Weight (g)	5.0	5.0	-
Final Weight (g)	<u>Not determinable</u>	<u>Not determinable</u>	-
Weight Loss (g)	-	-	-
Weight Loss (%)	-	-	-
Time to Ignition (s)	28	Did not ignite	-
Burning Duration (s)	92	-	-

**CONCLUSIONS**

The leather material identified in this report, when tested at an approximate thickness 1.5 mm, meets The Federal Railroad Administration requirements as they pertain to rate of smoke generation (ASTM E 662).

The leather also meets Bombardier requirements as they pertain to toxic gas production (Bombardier SMP 800-C).

  
I. Smith,  
Fire Testing.

  
Richard J. Lederle,  
Fire Testing.

*Note: This report consists of 4 pages, including the cover page, that comprise the report "body". It should be considered incomplete if all pages are not present. Additionally, the Appendix of this report comprises a cover page, plus 2 pages.*

**Bodycote Materials Testing Canada Inc.**

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*Rate of Smoke and Toxic Gas Generation of "Elmosoft" Leather*

*For: Blackstock Leather Inc.*

*Report No. 05-02-631*

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**APPENDIX**

(2 Pages)

**Summaries of Test Procedures**



**ASTM E 662-03e1**

Specific Optical Density of Smoke Generated by Solid Materials (NBS Smoke Chamber)

This method of test covers a procedure for measuring the smoke generated by solid materials and assemblies in thickness up to and including 1 inch (25.4 mm). Measurement is made of the attenuation of a light beam by smoke (suspended solid or liquid particles) accumulating within a closed chamber due to nonflaming pyrolytic decomposition and flaming combustion. Results are expressed in terms of specific optical density (Ds), which is derived from a geometrical factor and the measured optical density (absorbance).

Specimens are dried for 24 hours at 60°C and conditioned to equilibrium at 50% RH and 23°C.

Three specimens, 3" square, are exposed to each mode of combustion. The % light transmittance during the course of the combustion is recorded. These data are used to express the quantity of smoke in the form of Specific Optical Density based on the following formula which assumes the applicability of Bouguer's law:

$$D_s = (V/AL) \cdot \log(100/T) = G \cdot \log(100/T) = 132 \cdot \log(100/T)$$

Where: Ds = Specific Optical Density  
T = % Transmittance  
V = Chamber Volume (18 ft<sup>3</sup>)  
A = Exposed Area of the Sample (0.0456 ft<sup>2</sup>)  
L = Length of Light Path in Chamber (3.0 ft)  
G = Geometric Factor

Among the parameters normally reported are:

Ds	
1.5	- specific optical density after 1.5 minutes
Ds	
4.0	- specific optical density after 4.0 minutes
Dm	- maximum specific optical density at any time during the 20 minute test
Dm	
(corr)	- Dm corrected for incidental deposits on the optical surfaces

Transit authorities generally specify a maximum Ds 1.5 of 100 and a maximum Ds 4.0 of 200 in either flaming or non-flaming test mode.

For fabrics, The Federal Railroad Administration specifies a maximum Ds 4.0 of 200 in either flaming or non-flaming test mode.

## **Bodycote Materials Testing Canada Inc.**

### **Bombardier SMP 800-C**

#### 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) and Carbon Dioxide (CO<sub>2</sub>)

CO and CO<sub>2</sub> 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<sub>x</sub> and SO<sub>2</sub> are sampled by drawing 6 litres 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 15 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<sup>-</sup>. After the reaction is complete, CNCl forms a red-blue color 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<sub>x</sub>)

Nitrite and nitrate formed in the alkaline solution are determined using ion chromatography and conductivity detection. The nitrite and nitrate results are combined and the total expressed as nitrogen dioxide (NO<sub>2</sub>).

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

##### Analysis of Impingers for Sulphur Dioxide (SO<sub>2</sub>)

SO<sub>2</sub> is trapped in the NaOH impinger as sulphite and sulphate (SO<sub>3</sub><sup>-2</sup> and SO<sub>4</sub><sup>-2</sup>). Hydrogen peroxide is added to convert SO<sub>3</sub><sup>-2</sup> to SO<sub>4</sub><sup>-2</sup>. Resulting sulphate is determined using ion chromatography and conductivity detection.

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