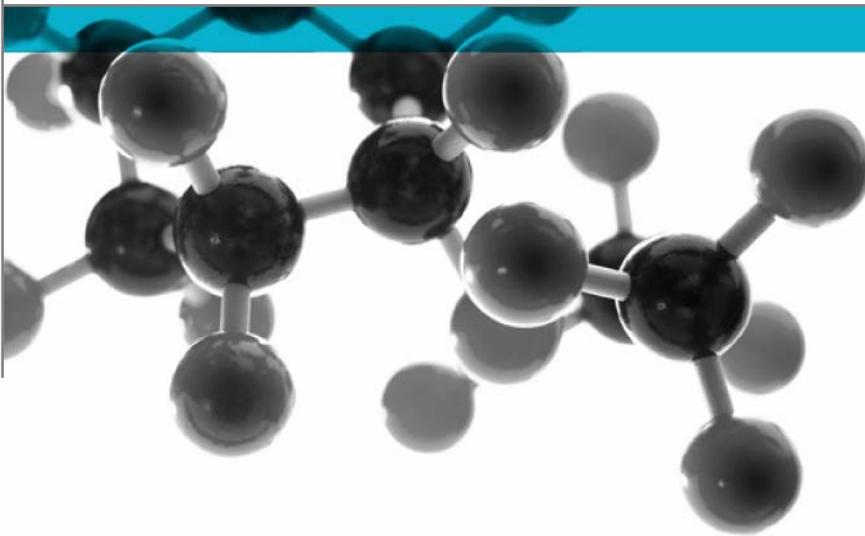


NF X 70-100-1: 2006 & NF X 70-100-2: 2006



**Fire tests, Analysis of gaseous effluents. Part 1:
Methods for analysing gases produced by thermal
degradation. Part 2: Tubular furnace thermal
degradation method.**

A Report To: Shore Auto Rubber Exports Pvt. Ltd.

Document Reference: 397436

Date: 18th May 2018

Issue No.: 1

Page 1

**Testing
Advising
Assuring**



Executive Summary

Objective To determine the performance of the following product when tested in accordance with the procedure specified in NF X 70-100-1: 2006 & NF X 70-100-2: 2006.

Generic Description	Product reference	Thickness	Density / specific gravity / weight per unit area
Silicone hose with three layers of fabric reinforcement	No specific reference assigned	7.24mm *	1.25g/cm ³ *
Individual components used to manufacture composite:			
Rubber	"58170C"	Unwilling to provide	1.25
Polyester fabric (Embedded in rubber)	"145 +/- 5 grams per square meter"	3 x 0.6mm	Unwilling to provide
* Determined by Exova Warringtonfire			
Please see page 5 of this test report for the full description of the product tested			

Test Sponsor Shore Auto Rubber Exports Pvt. Ltd., Gat 7, Post- Chimbli, Tal Khed, Dist, Pune – 410501, India

Summary of Test Results: When tested in accordance with the procedure specified in NF X 70–100-1: 2006 & NF X 70-100-2: 2006 at a temperature of 600°C, the following results were obtained:

- C.I.T (NF F 16-101 (withdrawn)) = 2.43
- R value (BS 6853 Annex B.1(withdrawn) / LUL S1085 Attachment A.1)) = 0.21
- C.I.T_{NLP} (BS EN 45545-2:2013+A1:2015) = 0.04

Date of Test 17th April 2018

Signatories

	
Responsible Officer C. Henry * Technical Officer	Authorised B. Dean * Technical Leader

* For and on behalf of **Exova Warringtonfire**.

Report Issued: 18th May 2018

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Client:	Shore Auto Rubber Exports Pvt. Ltd.	Issue No.:	1



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Test Details

Purpose of test To determine the performance of specimens of a material when they are subjected to the conditions of test specified in NFX 70 - 100: 2006 "Analysis Of Gaseous effluents, Part 1: Methods for analysing gases produced by thermal degradation and Part 2: Tubular furnace thermal degradation method".

The tests were performed in accordance with the procedure specified in NFX 70-100-1: 2006 and NF X 70-100-2: 2006 at a temperature of 600°C and this report should be read in conjunction with that Standard.

Scope of test NFX 70-100-1: 2006 and NF X 70-100-2: 2006 specifies a method of test for carrying out quantitative analysis of certain gases produced under specified conditions of thermal degradation in the presence of air.

Fire test study group/EGOLF Certain aspects of some fire test specifications are open to different interpretations. The Fire Test Study Group and EGOLF have identified a number of such areas and have agreed Resolutions which define common agreement of interpretations between fire test laboratories which are members of the Groups. Where such Resolutions are applicable to this test they have been followed.

Instruction to test The test was conducted on the 17th April 2018 at the request of Shore Auto Rubber Exports Pvt. Ltd, the sponsor of the test.

Condition of specimen edges Layered product, with no layer covering the edges

Photograph of specimen



Provision of test specimens The specimens were supplied by the sponsor of the test. **Exova Warringtonfire** was not involved in any selection or sampling procedure.

Conditioning of specimens The specimens were received on the 14th March 2018.

Prior to test the specimens were conditioned to constant mass at temperatures of $23 \pm 2^\circ\text{C}$ and a relative humidity of $50 \pm 5\%$ RH, for a minimum period of 48 hours prior to testing.

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Description of Test Specimens

The description of the system given below has been prepared from information provided by the sponsor of the test. This information has not been independently verified by **Exova Warringtonfire**.

All values quoted are nominal, unless tolerances are given.

General description		Silicone hose with three layers of fabric reinforcement
Product reference of overall composite		No specific reference assigned
Name of manufacturer of overall composite		Shore Auto Rubber Exports Pvt. Ltd.
Thickness of overall composite		6 ± 1mm (up to 7.5mm at the overlap) (stated by sponsor) 7.24mm (determined by Exova Warringtonfire)
Specific gravity		1.25 (stated by sponsor)
Density overall composite		1.25g/cm ³ (determined by Exova Warringtonfire)
Rubber	Generic type	Silicone
	Product reference	"58170C"
	Name of manufacturer/ further details	Shore Auto Rubber Exports Pvt. Ltd. is compounding the rubber in house. The raw material is bought out along with the pigment, accelerators and fillers.
	Thickness	See Note 1 Below
	Specific gravity	1.25
	Colour reference	"Grey"
	Flame retardant details	See Note 2 Below
Polyester fabric (Embedded in rubber)	Generic type	Polyester fabric
	Product reference	"145 +/- 5 grams per square meter"
	Name of manufacturer	See Note 1 Below
	Colour reference	"White"
	Number of layers	3
	Thickness per layer	0.6 ± 0.1mm
	Density / weight per unit area per layer	See Note 1 Below
	Type of weave / cell dimensions	See Note 1 Below
Flame retardant details	See Note 3 Below	
Brief description of manufacturing process		The Inner Rubber Liner, Fabric Plies and Outer Layer, all 3 are calendared and wrapped on the tool. Following this, they are cured, extracted from the mandrel, and then post-cured.

Note 1: The sponsor was unwilling to provide this information.

Note 2: The sponsor was unable to provide this information as they are not the manufacturer of the raw material. The base raw material used is FR 8775U from Bluestar Silicones. Bluestar Silicones adds the flame retardants and the sponsor is not aware of the flame retardants contained within the base raw material purchased. The sponsor does the compounding inhouse by adding pigments, accelerators and other fillers.

Note 3: The sponsor of the test has confirmed that no flame retardant additives were utilised in the production of the component.

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Test Results

Applicability of test results

The test results relate only to the behaviour of the specimens of the product under the particular conditions of test; they are not intended to be the sole criterion for assessing the potential smoke hazard of the product in use.

The test results relate only to the specimens of the product in the form in which they were tested. Small differences in the composition of the product may significantly affect the performance during the test and will therefore invalidate the test results. It is the responsibility of the supplier of the product to ensure that the product, which is supplied, is identical with the specimens, which were tested.

Expression of Gas Content

C.I.T. calculation as described in NF F 16-101 (withdrawn)

The contents "ti" of gases (CO, CO₂, HCl, HBr, HF, HCN and SO₂) are expressed in milligrams of gas per gram of material. From these values of "ti", and the corresponding reference values "cc_i", a conventional index of toxicity, designated "C.I.T", is determined using the following equation:-

$$C.I.T = 100 \times \sum \frac{ti}{cc_i}$$

R value calculation as described in BS 6853 Annex B.1 (withdrawn)

The contents of gases (CO, CO₂, HCl, HBr, HF, SO₂, HCN, NO₂) are expressed in milligrams of gas per gram of material. From these values of "cx" and the corresponding values of reference values "fx", a weighted summation of toxicity, designated "R", is determined using the following equation:-

$$R_x = cx/fx$$

$$R = \sum R_x$$

C.I.T._{NLP} calculation as described in (BS EN 45545-2:2013+A1:2015)

The contents "c_i" of gases (CO, CO₂, HCN, HCl, HBr, HF, SO₂ and NO_x) are expressed in milligrams of gas per gram of material. From these values of "c_i" and the corresponding values of reference values "C_i", a conventional index of toxicity, designated "C.I.T", is determined using the following equation:-

$$C.I.T = \sum \frac{c_i}{C_i}$$

Note, NF F 16-101 (withdrawn), BS 6853 (withdrawn) and (BS EN 45545-2:2013+A1:2015) utilised different reference values

The individual results obtained are given in table 1.

Conclusion

When tested in accordance with the procedure specified in NF X 70-100-1: 2006 & NF X 70-100-2: 2006 at a temperature of 600°C, the results obtained were

- C.I.T calculated in accordance with NF F 16-101 (withdrawn) = 2.43
- R value calculated in accordance with BS 6853 Annex B.1(withdrawn) / LUL S1085 Attachment A.1 = 0.21

It must be noted that the following applies to BS 6853 (withdrawn): this R value must only be used to demonstrate compliance against the requirements specified in Tables 7 & 8 (minor use materials), Table 11 (textiles) and Tables 13 & 14 (cables) of BS 6853: 1999 (withdrawn). Should an R value be required to demonstrate compliance against any other table in BS 6853: 1999 (withdrawn), then a test in accordance with BS 6853: 1999: Annex B.2 (withdrawn) must be performed.

- C.I.T_{NLP} calculated in accordance with BS EN 45545-2:2013+A1:2015 = 0.04

It must be noted that this C.I.T value must only be used to demonstrate compliance of non-listed products. Should a C.I.T value be required to demonstrate compliance of a general product, then a C.I.T_G must be calculated.

Validity

The specification and interpretation of fire test methods are the subject of ongoing development and refinement. Changes in associated legislation may also occur. For these reasons it is recommended that the relevance of test reports over five years old should be considered by the user. The laboratory that issued the report will be able to offer, on behalf of the legal owner, a review of the procedures adopted for a particular test to ensure that they are consistent with current practices, and if required may endorse the test report.

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Table 1

GASES	Concentration (mg/g)	NF F 16-101 (withdrawn) reference values, c_i (mg/m³)	BS 6853 (withdrawn) reference values, F_x (mg/g)	(BS EN 45545-2) reference values, C_i (mg/m³)	CIT (NF F 16-101 (withdrawn))	r value (BS 6853 Annex B.1 (withdrawn))	CIT_{NLP} (BS EN 45545-2)
CARBON MONOXIDE	26.79	1750	280	1380	1.53	0.10	0.02
CARBON DIOXIDE	800.86	90000	14000	72000	0.89	0.06	0.01
HYDROGEN CHLORIDE	ND	150	15	75	0.00	0.00	0.00
HYDROGEN BROMIDE	ND	170	20	99	0.00	0.00	0.00
HYDROGEN CYANIDE	0.01	55	11	55	0.01	0.00	0.00
HYDROGEN FLUORIDE	ND	17	4.9	25	0.00	0.00	0.00
SULPHUR DIOXIDE	ND	260	53	262	0.00	0.00	0.00
NITROUS OXIDES	0.44	N/A	7.6	38	N/A	0.06	0.01

Where ND indicates non-detected
N/A indicates not applicable

Observations

In the case of each specimen the test duration was 40 minutes and the volume of the gas sampled was 80 litres. In each case the air was circulated using a suction method.

In the case of each specimen a nominally 1g sample was obtained which was representative of the substance or material as used in practice.

Specimen No.	1	2	3	1	2	3	1	2	3	1	2	3
Gases	HCN			HCl / HBr / SO ₂			HF			NO _x		
Mass (g)	1.0158	1.0189	1.0192	0.9588	0.9925	1.0015	1.0301	N/A	N/A	1.0362	1.0412	1.0472
Mass loss (g)	0.3286	0.3679	0.3815	0.3212	0.3532	0.3330	0.3661	N/A	N/A	0.3383	0.3454	0.3707
Mass loss (%)	32.35	36.11	37.43	33.50	35.59	33.25	35.54	N/A	N/A	32.65	33.17	35.40
Ignition time (min:secs) (if applicable)	01:21	01:15	01:13	01:03	01:03	01:02	01:03	N/A	N/A	01:19	01:17	01:02
Extinction time (min:secs) (if applicable)	03:19	03:11	03:16	03:02	03:01	03:09	03:20	N/A	N/A	03:04	03:09	03:10
Key:												
N/A = Not applicable												

Revision History

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Revised By:	Approved By:
Reason for Revision:	

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