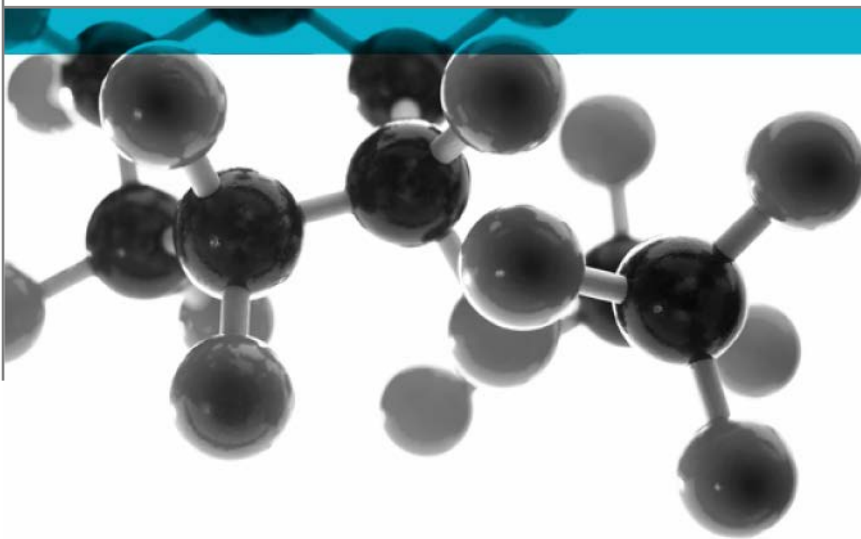


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Review Fire Test Report



Determination of weighted summation of toxic fume, R – Area based test method

A Report To: L'Isolante K-Flex S.p.A.

Document Reference: 352533

Date: 1st June 2015

Issue No.: 1

Page 1

Testing
Advising
Assuring



Executive Summary

Objective To review and extend the validity period of Exova Warringtonfire Test Report No: 191117 which details the test results of the material when tested in accordance with BS 6853: 1999 incorporating amendment No. 1: Annex B.2:

Generic Description	Product reference	Thickness	Density
Acoustical insulation high mass material, polymer based, made from rubber, thermoplastics, fillers, flame retarders	"K-FONIK GV"	2±0.2 mm	2000±100 kg/m ³
Please see page 4 of this test report for the full description of the product tested			



Test Sponsor L'Isolante K-Flex S.p.A., Via Leonardo da Vinci 36, 20877 Roncello (MB) Italy.

Conclusion With respect to test report WF No. 191117, its contents shall remain valid until the 7th March 2020.

This review should be read in conjunction with test report WF No. 191117.

Date of Test 8th & 15th March 2010

Signatories

	
Responsible Officer C. Lester * Technical Officer	Authorised S. Deeming * Business Unit Head

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

Report Issued: 1st June 2015

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Test Details

Introduction

Test report EWF No. 191117 relates to a test performed in accordance with the procedures defined in BS 6853: 1999 incorporating amendment No. 1: Annex B.2, determination of weighted summation of toxic fume, R - Area based test method, on the following specimens:

General description	Acoustical insulation high mass material, polymer based, made from rubber, thermoplastics, fillers, flame retarders
Product reference	"K-FONIK GV"
Detailed description / composition details	EPDM rubber, thermoplastics, mineral fillers and flame retarders
Name of manufacturer	L'Isolante K-Flex Srl Via Leonardo da Vinci, 36 20040 RONCELLO (MI) Italy
Density	2000±100 kg/m ³ (stated by sponsor) 2258.61kg/m ³ (determined by Exova Warringtonfire)
Thickness	2±0.2 mm (stated by sponsor) 1.58mm (determined by Exova Warringtonfire)
Colour	"Grey"
Trade name of flame retardant	See Note 1 below
Generic type of flame retardant	ATH, magnesium hydroxide
Amount of flame retardant	See Note 1 below
Brief description of manufacturing process	Masterbatch mixed in bambury, production in calender.

Note 1: The sponsor of the test was unwilling to provide this information

Test Results

Gases sampled

Test report EWF No. 191117 contains the following results:

$D_{s_{max}}$	35
Time to $D_{s_{max}}$ (T_{max})	13:00
Time to 85% of $D_{s_{max}}$ (T_{max} 85%)	8:30

Three further specimens were then tested. Gases generated were sampled after eight minutes thirty seconds test duration. The quantitative determinations were then carried out using the procedures described. The test results obtained are provided below and test observations are detailed in Table 1.

Gas	Specimen No. 1	Specimen No. 2	Specimen No. 3	Average
Carbon Monoxide	9.45	14.07	18.90	14.14
Carbon Dioxide	1513.19	1470.07	1454.75	1479.33
Sulphur Dioxide	ND	ND	ND	ND
Hydrogen Chloride	ND	ND	ND	ND
Hydrogen Bromide	ND	ND	ND	ND
Hydrogen Fluoride	ND	ND	ND	ND
Hydrogen Cyanide	ND	ND	ND	ND
Nitrogen Oxides	0.17	0.17	0.17	0.17

Where:
 ND indicates non-detected.
 Note: All values given are in g/m^2 .

Weighted Summation of Toxic Fume, R

The test results obtained for toxicity measurements were used to calculate the weighted summation index, R, as described in BS 6853: 1999: Annex B.4.2.

The R Value determined was 0.18.

Confirmation of Specification

Subsequent to the issue of the original test report, a representative of the sponsor of the test has stated that the sponsor has changed the name of the company. The correct name of the company is now L'Isolante K-Flex S.p.A.. The new company name is referred to in this review report.

It has been confirmed in writing by L'Isolante K-Flex S.p.A. that there have been no changes to the product description contained within test report WF No. 191117 and that the product which is currently being manufactured is identical in every respect to the specimens which were tested.

It has also been confirmed in writing that no further fire testing of the previously fire tested specification has been performed since the issue of the test report, and no other individual or organisation has been asked to provide a technical review of the reports.

Conclusions

The procedures adopted for the original test (BS 6853:1999 Annex B.2) have been re-examined and are identical in all respects to those currently in use (BS 6853:1999 Annex B.2), therefore, with respect to test report WF No. 191117; its contents shall remain valid until 7th March 2020.

This review should be read in conjunction with test report WF No. 191117.

Validity

This review is based on information used in the original test report. No other information or data has been submitted by L'Isolante K-Flex S.p.A., which could affect this review.

Table 1

Testing with Flame Application									
Specimen	D _s after t in minutes							D _s max. within 1.5 min	D _s max. within 4 min
	1	1.5	2	3	4	5	6		
Smoke run	1	5	13	19	23	28	29	5	23

Observations during test

Specimen No.	Initial Smoke Production Test	Toxicity Tests		
		1	2	3
Colour of smoke produced	Light	Light	Light	Light
Expansion distance towards heater (mm)	10	10	10	10
Ignition time in seconds (if applicable)	142	115	135	138
Extinction time in seconds (if applicable)	600	End	End	405
0 = Did Not Occur * = Did Not Re-ignite N/A = Not Applicable				

Revision History

Issue No :	Issue Date:
Revised By:	Approved By:
Reason for Revision:	

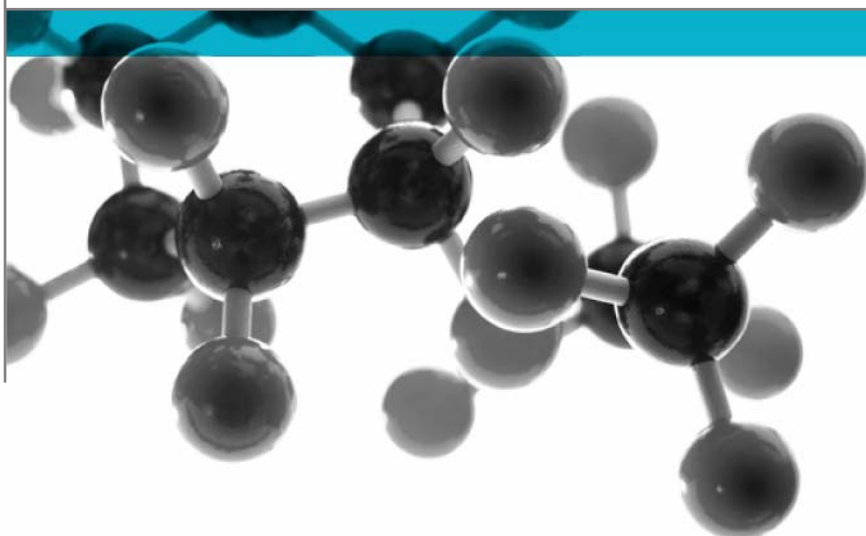
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BS 6853:1999 Annex B.2



Area Based Toxic Fume Test Used In The Design And Construction Of Passenger Carrying Trains

A Report To: L'Isolante K-Flex Srl

Document Reference: 191117

Date: 23rd March 2010

Issue No.: 1

Page 1

Testing
Advising
Assuring



Exova Warringtonfire Test Report No. 191117

**Determination of Weighted Summation of Toxic
Fume, R,
As Described in Annex B (Informative) of
BS 6853:1999, Incorporating Amendment 1,
Code of Practice for Fire Precautions
in the design and construction of Passenger
Carrying Trains**

Sponsored By

**L'isolante K- Flex Srl
Sede Legale, Uffici E Stabilimento:
Via Leonardo Da Vinci 36
20040 Roncello
Milan
Italy**

Document No.: 191117

Page No.: 2 of 11

Author: J. Lucas-Cox

Issue Date: 23rd March 2010

Client: L'isolante K-Flex Srl

Issue No.: 1



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Test Details

Introduction

Exova Warringtonfire was commissioned to carry out an area based toxicity test in accordance with the method recommended in BS6853:1999 Incorporating Amendment 1, Informative Annex B.2. This standard recommends that the test is carried out using the apparatus detailed in prEN2824 but the ignition cone used should conform with the requirements given in BS ISO 5659-2 and that the quantitative determination of the gases emitted should be carried out in accordance with the procedure specified in prEN2826.

The test was performed in accordance with the procedure specified in prEN2825 and prEN2826 amended in accordance with the recommendations given in BS6853: 1999 Annex B and this report should be read in conjunction with these and other related standards.

Test method

The principle of the test methods detailed in prEN2825 and prEN2826 is to expose a material to specified thermal conditions of pyrolysis and combustion in a continuous procedure. The change in optical density of the smoke produced when dispersed within a fixed volume of air is recorded throughout the period of test. Quantitative determination of toxic gases emitted is carried out using wet analysis.

The test method provides a means for the comparative assessment of products, however, it does not model a real fire situation and the results cannot therefore be used to describe the fire hazard of materials under actual fire conditions.

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 has 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 8th March and 15th March 2010 at the request of L'isolante K-Flex Srl, the sponsor of the test.

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 23rd February 2010.

The specimens were conditioned at temperatures of $23 \pm 2^\circ\text{C}$ and a relative humidity of $50 \pm 5\%$ RH, for a minimum period of 24 hours prior to testing.

Test Face

One of two identical faces of the specimen was exposed to the radiant heat source.

Description of Test Specimens

The description of the specimens given below has been prepared from information provided by the sponsor of the test. All values quoted are nominal, unless tolerances are given.

General description	Acoustical insulation high mass material, polymer based, made from rubber, thermoplastics, fillers, flame retarders
Product reference	"K-FONIK GV"
Detailed description / composition details	EPDM rubber, thermoplastics, mineral fillers and flame retarders
Name of manufacturer	L'Isolante K-Flex Srl Via Leonardo da Vinci, 36 20040 RONCELLO (MI) Italy
Density	2000±100 kg/m ³ (stated by sponsor) 2191.67kg/m ³ (determined by Exova Warringtonfire)
Thickness	2±0.2 mm (stated by sponsor) 1.65mm (determined by Exova Warringtonfire)
Colour	Grey
Trade name of flame retardant	See Note 1 below
Generic type of flame retardant	ATH, magnesium hydroxide
Amount of flame retardant	See Note 1 below
Brief description of manufacturing process	Masterbatch mixed in bambury, production in calender.

Note 1. The sponsor of the test was unwilling to provide this information

Test Procedure

Specimens were tested in the flaming mode in a horizontal position by exposure to the heating arrangement specified in ISO 5659-2. The heat flux was 25kW/m².

The sampling and analysis of the fire gases generated during the test is conducted using a variety of methods as defined in the internal operating procedure.

In all cases, the sample is taken from the geometric centre of the chamber with sample lines being kept as short as possible to minimise sample losses.

For the analysis of oxides of carbon and nitrogen, continuous measurements are made throughout the duration of the test.

Carbon dioxide (CO₂) and carbon monoxide (CO) are determined continuously using precalibrated non-dispersive infra-red analysers. The values reported are those measured at 85% smoke obscuration.

Oxides of nitrogen (NO_x) are determined continuously using a chemiluminescence analyser. Again, the values reported are those measured at 85% smoke obscuration.

For the other gases, single point analysis is conducted, the gases being absorbed into an aqueous media and analysed remotely. Two types of media are used, 0.1M sodium hydroxide solution and 0.3% hydrogen peroxide solution. The gases are sampled over a two minute period commencing when smoke density has reached 85% obscuration by bubbling the gases through the aqueous media using a fitted funnel Dreschel bottle arrangement.

Hydrogen cyanide (HCN) is determined from gases absorbed into a 0.1M solution of sodium hydroxide and analysed using ion chromatography. The concentration determined is an average over each 2 minute period beginning at 85% smoke obscuration.

Hydrogen chloride (HCl), hydrogen bromide (HBr), hydrogen fluoride (HF) and sulphur dioxide (SO₂) are absorbed into a 0.3% solution of hydrogen peroxide and are also analysed by ion chromatography. The concentration determined is an average over each 2 minute period beginning at 85% smoke obscuration.

Test Results

Applicability of test results of 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 and toxicity 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 or thickness 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.

Gases sampled One specimen was tested to determine the $D_{s_{max}}$ and time to $D_{s_{max}}$. From the results of this test time to reach 85% of $D_{s_{max}}$ was calculated. The results are given below:

$D_{s_{max}}$: 35
 Time to $D_{s_{max}}$ (T_{max}) : 13:00
 Time to 85% of $D_{s_{max}}$ (T_{max} 85%) : 8:30

Three further specimens were then tested. Gases generated were sampled after eight minutes thirty seconds test duration. The quantitative determinations were then carried out using the procedures described. The test results obtained are given in Table 1.

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Hydrogen Fluoride	ND	ND	ND	ND
Hydrogen cyanide	ND	ND	ND	ND
Nitrogen Oxides	0.17	0.17	0.17	0.17

Where ND indicates non-detected.

Note: All values given are in g/m^2 .

Weighted Summation of Toxic Fume, R of **The test results obtained for toxicity measurements were used to calculate the weighted summation index, R, as described in BS 6853:1999, Clause B.4.2.**

The R Value determined was 0.18.

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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Signatories



Approved
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Principal Chemist



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

Report Issued: 23rd March 2010

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