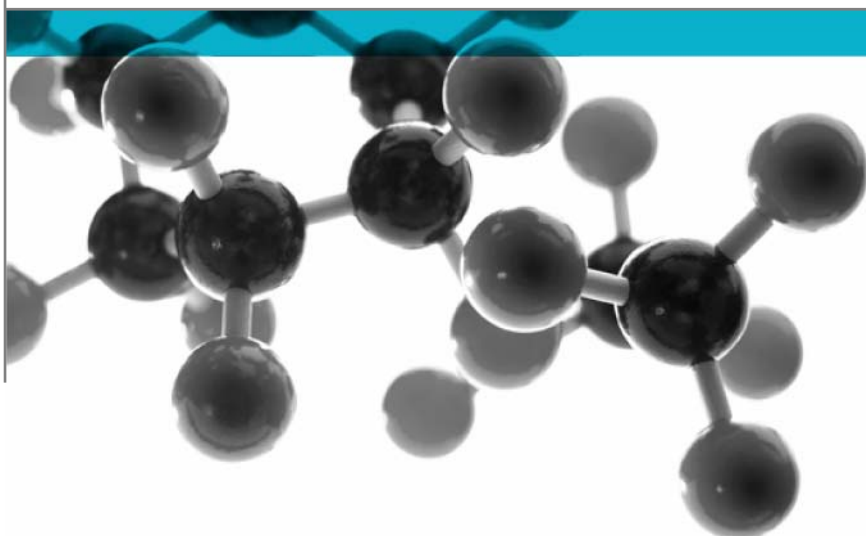


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# BS 6853:1999: Annex B.2



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

A Report To: Applied Media

Document Reference: 317888

Date: 30<sup>th</sup> April 2012

Issue No.: 1

Page 1

Testing  
Advising  
Assuring



## Executive Summary

**Objective** To determine the toxic fume produced from the following product when tested in accordance with BS 6853: 1999 incorporating amendment No. 1: Annex B.2:



Generic Description	Product reference	Thickness	Weight per unit area or density
Self-adhesive printed floor graphic material applied to one face of a fibre cement board substrate	"Applied Media"	7.61mm*	12.87kg/m <sup>2</sup> *
<b>Individual components used to manufacture composite:</b>			
Self-adhesive floor graphic	"Applied Media"	1.8mm	3.5kg/m <sup>2</sup>
Fibre cement board substrate	"NT D4 604"	6mm	1900±200kg/m <sup>3</sup>
* Determined by Exova Warringtonfire			
Please see page 5 of this test report for the full description of the product tested			

**Test Sponsor** Applied Media, 7 Brock Way, Knutton, Newcastle under Lyme, Staffordshire, ST5 6AZ

**Summary of Test Results:** The R Value determined was 0.94.

**Date of Test** 23<sup>rd</sup> and 25<sup>th</sup> April 2012

## Signatories

	
Responsible Officer J. Lucas-Cox * Principal Chemist	Authorised S. Deeming * Operations Manager

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

Report Issued: 30<sup>th</sup> April 2012

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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 BS 6853:1999 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 23<sup>rd</sup> and 25<sup>th</sup> April 2012 at the request of Applied Media, 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. **Exova Warringtonfire** supplied the substrate, and the sponsor applied the film to the substrate to form the composite

### Conditioning of specimens

The specimens were received on the 18<sup>th</sup> April 2012.

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

The decorative face 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		Self-adhesive printed floor graphic material applied to one face of a fibre cement board substrate	
Overall thickness		7.61mm (determined by <b>Exova Warringtonfire</b> )	
Overall weight per unit area		12.87kg/m <sup>2</sup> (determined by <b>Exova Warringtonfire</b> )	
Self-adhesive floor graphic	Product reference	"Applied Media"	
	Thickness	1.8mm	
	Weight per unit area	3.5kg/m <sup>2</sup>	
	Name of manufacturer	W J Roadmarkings Limited t/a Applied Media	
	Soda glass granules	Product reference	"100% Soda Glass Aggregate"
		Generic type	Soda glass granules
		Name of manufacturer	<b>See Note 1 below</b>
		Application thickness	<b>See Note 1 below</b>
		Weight per unit area	<b>See Note 1 below</b>
		Colour	"Transparent"
	Surface coating	Flame retardant details	<b>See Note 2 below</b>
		Product reference	"PU Acrylic Laminate"
		Generic type	PU acrylic laminate
		Name of manufacturer	<b>See Note 1 below</b>
		Number of coats	<b>See Note 1 below</b>
		Application rate / thickness per coat	<b>See Note 1 below</b>
	Printing	Colour	"Transparent"
		Flame retardant details	<b>See Note 2 below</b>
		Product reference	"Solvent Ink"
		Generic type	Inkjet solvent
		Name of manufacturer	<b>See Note 3 below</b>
		Weight per unit area	<b>See Note 3 below</b>
	Polymeric base	Thickness	<b>See Note 3 below</b>
		Colour	<b>See Note 3 below</b>
		Flame retardant details	<b>See Note 2 below</b>
		Product reference	"Polymeric Blend Media"
		Generic type	High quality blend of polymeric elastomers <b>See Note 1 below</b>
		Name of manufacturer	<b>See Note 1 below</b>
Adhesive backing	Weight per unit area	<b>See Note 1 below</b>	
	Thickness	<b>See Note 1 below</b>	
	Colour	"White"	
	Flame retardant details	<b>See Note 2 below</b>	
	Product reference	"Pressure Sensitive Adhesive System"	
	Generic type	Natural rubber	
	Name of manufacturer	<b>See Note 3 below</b>	
	Application rate	36g/m <sup>2</sup>	
	Application method	Screed in manufacturing process	
	Flame retardant details	<b>See Note 2 below</b>	

Substrate	Trade name	"NT D4 604"
	Generic Description	Fibre cement board
	Supplier	Scheeders van de Kerkhove (SVK)
	Overall thickness	6mm
	Overall density	1900 ± 200kg/m <sup>3</sup>
	Flame retardant details	The substrate is inherently flame retardant
Brief description of manufacturing process of the floor covering		Processed blend of polymers, coated base of adhesive, inkjet solvent print and top coated with PU acrylic and soda glass.

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

**Note 2. The sponsor of the test has confirmed that no flame retardant additives were utilised in the production of the product / component.**

**Note 3. The sponsor of the test has provided this information but at the specific request of the sponsor, these details have been omitted from the report and are instead held on the confidential file relating to this investigation.**

The description of the specimens as given above is not as detailed as would usually be the case for descriptions included in **Exova Warringtonfire** test reports and the description may not fully comply with the requirements of the test standard. In all other respects however the tests were conducted fully in accordance with the requirements of the test standard and the test results are valid.

## Test Procedure

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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/m<sup>2</sup>.

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 (CO<sub>2</sub>) 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<sub>x</sub>) 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 (SO<sub>2</sub>) 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

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  $Ds_{max}$  and time to  $Ds_{max}$ . From the results of this test time to reach 85% of  $Ds_{max}$  was calculated. The results are given below:

$Ds_{max}$	194
Time to $Ds_{max}$ ( $T_{max}$ )	4:00
Time to 85% of $Ds_{max}$ ( $T_{max}$ 85%)	2:30

Three further specimens were then tested. Gases generated were sampled after two 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	9.85	14.68	10.25	11.59
Carbon Dioxide	552.99	618.39	763.23	644.87
Sulphur Dioxide	0.16*	ND	0.66	0.27
Hydrogen Chloride	2.93	2.97	3.21	3.04
Hydrogen Bromide	ND	ND	ND	ND
Hydrogen Fluoride	ND	ND	ND	ND
Hydrogen Cyanide	ND	ND	ND	ND
Nitrogen Oxides	4.95	4.79	4.95	4.90

Where: ND indicates non-detected.  
 \* indicates  $\leq$  limit of quantification.  
 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 0.94.



## 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**

Testing with Flame Application									
Specimen	D <sub>s</sub> after t in minutes							D <sub>s</sub> max. within 1.5 min	D <sub>s</sub> max. within 4 min
	1	1.5	2	3	4	5	6		
Smoke run	0	17	118	190	194	191	186	17	194

**Observations during test**

Specimen No.	Initial Smoke Production Test	Toxicity Tests		
		1	2	3
Colour of smoke produced	Dark	Dark	Dark	Dark
Expansion distance towards heater (mm)	N/A	N/A	N/A	N/A
Ignition time in seconds (if applicable)	77	67	74	73
Extinction time in seconds (if applicable)	175	200	190	213
Re-ignition time in seconds (if applicable)	610	*	*	*
Extinction time in seconds (if applicable)	1110	N/A	N/A	N/A
Re-ignition time (2) in seconds (if applicable)	*	*	*	*
Extinction time in seconds (if applicable)	N/A	N/A	N/A	N/A

\* = 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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