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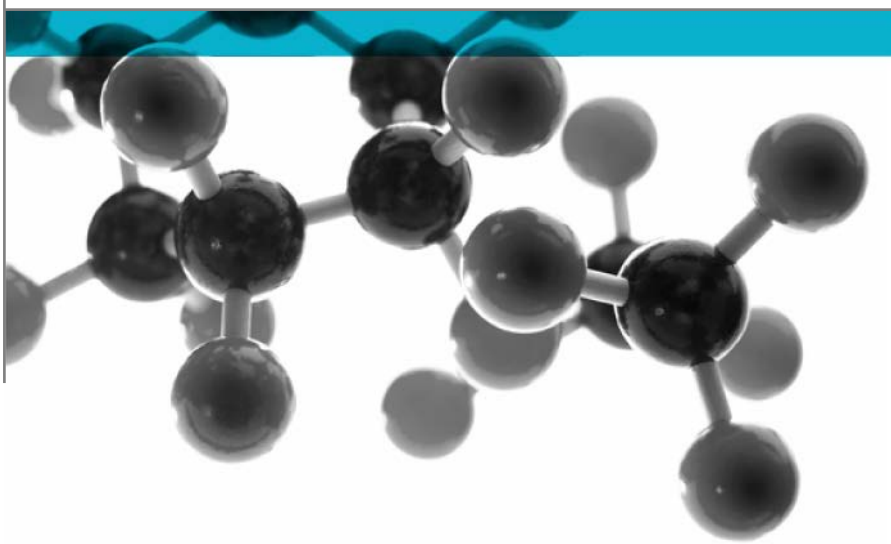
IMO Resolution MSC 307(88) (2010 FTP Code): Annex 1: Part 2



Smoke & Toxicity

A Report To: WSBL Ltd.

Document Reference: 502169

Date: 8th July 2021

Issue No.: 1

Expiry Date: 18th May 2036

Executive Summary

Objective To determine the performance of the following product when tested in accordance with IMO Resolution MSC 307(88): Annex 1: Part 2.

Generic Description		Product reference	Thickness	Weight per unit area or density
Polymeric decoupled acoustic barrier mat		"Revac® Momentum™ S FF"	5.0mm	2.0g/cm³
Individual components used to manufacture composite:				
Facing	Foil	Unable to provide	Unable to provide	Unable to provide
	Reinforcing scrim	Unable to provide	Unable to provide	Unable to provide
	Adhesive	Unable to provide	Unable to provide	25g/m²
Rubber		"Revac® Momentum™ S"	5.0mm	2.0g/cm³
Please see pages 5 & 6 of this test report for the full description of the product tested				

Test Sponsor WSBL Ltd., Durbar Mill, Hereford Road, Blackburn, Lancashire, BB1 3JU

Summary of Test Results: **The specimens meet all the criteria for smoke generation and toxicity for bulkhead, wall and ceiling products as specified in the Resolution.**

Date of Test 21st & 22nd April and 19th May 2021

Signatories

Responsible Officer K. Deluce * Testing Officer	Authorised J. Lucas-Cox * Operations Manager

* For and on behalf of Warringtonfire.

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Test Details

Purpose of test

This test method, adopted by the International Maritime Organisation, specifies a procedure for qualifying smoke generation and toxic potency of products and thus their suitability for use in maritime construction.

The test was performed in accordance with the procedure specified in IMO Resolution MSC 307(88): Annex 1, Part 2 and it is advised that this report is read in conjunction with this document.

Scope of test

International Maritime Organisation Resolution MSC 307(88): Annex 1, Part 2 incorporates the following methods:

Appendix 1 – Test procedure for smoke generation

Appendix 2 – Test procedure for gas measuring

The Resolution details a classification system based on the maximum specific optical density of smoke occurring during the test, averaged over three replicate tests, carried out in each of the three test conditions.

In addition, the Resolution specifies limits for seven toxic gases which must not be exceeded in any of the three test 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 21st & 22nd April and 19th May 2021 at the request of WSBL Ltd., the sponsor of the test.

Conditioning of specimens

The specimens were received on the 16th March 2021.

Prior to test the specimens were conditioned to constant mass at a temperature of 23 ± 2°C and a relative humidity of 50 ± 5%.

Test apparatus data

- Inner volume of the gas cell = 0.2 Litres
- Inner volume of gas sampling line = 0.1 Litres
- Length of gas sampling line = 2 metres
- Max capacity of gas sampling pump = 4.5L/min

Exposed face

The foil face of the specimens was exposed to the radiant heat of the test when the specimens were mounted in the test position.

Substrate

The specimens were tested with a 12mm thick calcium silicate substrate present.

Provision of test specimens

The specimens were supplied by the sponsor of the test. Warringtonfire was not involved in any selection or sampling procedure. The results stated in this report apply to the sample as received.

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 Warringtonfire**.** All values quoted are nominal, unless tolerances are given.

General description			Polymeric decoupled acoustic barrier mat
Product reference of overall composite			"Revac® Momentum™ S FF"
Name of manufacturer of overall composite			WSBL Ltd
Thickness of overall composite			5.0mm (stated by sponsor) 5.52mm (determined by Warringtonfire)
Density of overall composite			2.0g/cm³ (stated by sponsor) 1.88g/cm³ (determined by Warringtonfire)
Facing	Foil	Generic type	Aluminium foil
		Product reference	**See Note 1 below**
		Name of manufacturer	Rothel
		Thickness	**See Note 1 below**
		Weight per unit area	**See Note 1 below**
		Colour	Silver
		Flame retardant details	**See Note 2 below**
	Reinforcing scrim	Generic type	Glass fibre scrim
		Product reference	**See Note 1 below**
		Name of manufacturer	Rothel
		Colour	White
		Thickness	**See Note 1 below**
		Weight per unit area	**See Note 1 below**
		Type of weave / cell dimensions	Plain weave 5mm x 5mm
		Flame retardant details	**See Note 2 below**
	Adhesive	Generic type	Polythene hot melt
		Product reference	**See Note 1 below**
		Name of manufacturer	Rothel
		Colour	Clear
		Application rate	25g/m²
		Application method	**See Note 1 below**
		Flame retardant details	**See Note 2 below**
		Curing process	**See Note 1 below**

Continued on next page

Rubber	Generic type	Thermoplastic elastomer
	Product reference	"Revac® Momentum™ S"
	Detailed description	**See Note 3 below**
	Name of manufacturer	WSBL Ltd
	Thickness	5.0mm
	Density	2.0g/cm³
	Weight per unit area	10kg/m²
	Colour reference	Black
	Flame retardant details	**See Note 2 below**
Brief description of manufacturing process		**See Note 3 below**

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

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

Note 3. The sponsor of the test was unwilling to provide this information.

The description of the specimens as given above is not as detailed as would usually be the case for descriptions included in 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 Results

Test procedure

A 75mm x 75mm specimen is mounted horizontally inside a smoke chamber of the design specified in ISO 5659 Part 2, 25mm below a cone shaped, radiant electric heater capable of producing a uniform irradiance of 50kW/m^2 on the specimen surface. A premixed propane/air pilot flame of length 30mm may be applied 10mm above the specimen surface.

Three replicate specimens are tested in each of the following three test conditions at a mounted specimen distance of either 25mm or 50mm below the cone radiant heater:

1. Irradiance of 25kW/m^2 in the presence of pilot flame.
2. Irradiance of 25kW/m^2 in the absence of pilot flame.
3. Irradiance of 50kW/m^2 in the absence of pilot flame.

The attenuation of a light beam passing through the evolved smoke is measured and the results are reported in terms of the maximum Specific Optical Density attained during the test, given by the equation:

$$Ds = (V/(A*L)*\log_{10} (100/T)$$

Where:

V	=	total volume of the chamber (m^3)
A	=	exposed area of the specimen (m^2)
L	=	optical length (m) of smoke measurement
T	=	% light transmitted.

The initial test at each test condition is twenty minutes to verify the possible existence of a second minimum transmittance value. If the minimum transmittance value is shown by the initial test to occur within the first ten minutes, then subsequent tests for that test condition may have an exposure of 10 minutes. Otherwise, the tests shall last twenty minutes.

In the case of intumescing materials, a preliminary test at each test condition is performed with the specimen mounted horizontally inside the chamber 25mm below the cone shaped, radiant electric heater. In accordance with ISO 5659-2, if the specimen should intumesce more than 10mm during these preliminary tests, the mount distance of the specimen is to increase from 25mm to 50mm below the radiant heater.

The sampling of the fire effluent created in the chamber during the test for the analysis of the concentration of the seven different gases for which criteria are given is conducted using Fourier Transform Infra Red (FT-IR) analysis. The FT-IR has been calibrated by the analyser manufacturer (Thermo) using library spectrum and bottled gases.

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

The gas measurement in each case is carried out when the maximum smoke density is obtained called Dm Sampling Time (DmST). This time is determined by the initial smoke density measurement test performed at each test condition.

Sampling Response Period (SRP) is the minimum time necessary during the sampling period to completely load the FT-IR gas cell including the time to transfer the effluents flow from the smoke chamber into the cell. Sampling commences at DmST – (SRP x 0.5) seconds.

Test Results

The test results relating to smoke production are detailed in Appendix I of this report.

The test results relating to toxicity production are detailed in Appendix II of this report.

Observations recorded during the tests are detailed in Appendix III of this report.

Summary of Results

The specimens meet all the criteria for smoke generation and toxicity for bulkhead, wall and ceiling products as specified in the Resolution.

Validity

This report is valid for a period of fifteen years from the date of test.

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The tests results relate only to the specimens of the product in the form in which they are tested, they are not intended to be the sole criterion for assessing the potential fire hazard of the product in use. Small differences in the composition or thickness of the product may significantly affect the performance during the test and may therefore invalidate the test results. Care should be taken to ensure that any product which is supplied or used is fully represented by the specimens that were tested.

The quantity of each specific toxic gas species generated is dependant upon the fire model used and the burning behaviour of the specimen during each individual fire test. The quantitative determination of combustion products therefore relates only to the specimens tested under the conditions stated and when combustion occurs as described in this test report.

References

1. IMO Resolution MSC 307(88): Annex 1, Part 2: Smoke And Toxicity Test.

2. ISO 5659-2: 2017 Plastics - Smoke Generation - Part 2: Determination of Optical Density by a Single Chamber Test.

Appendix I – Smoke production during test

Condition			25kW/m^2 In The Presence Of A Pilot Flame	25kW/m^2 In The Absence Of A Pilot Flame	50kW/m^2 In The Absence Of A Pilot Flame
Maximum Specific Optical Density	Specimen 1	Ds (max)	1	1	1
		Time to Ds (max)	1200	1200	1200
		D (Clear beam)	0	1	0
	Specimen 2	Ds (max)	0	1	2
		Time to Ds (max)	67	1035	1193
		DmST**	1200	1200	1200
		D (Clear beam)	0	0	0
	Specimen 3	Ds (max)	0	1	2
		Time to Ds (max)	57	1091	1199
		DmST**	1200	1200	1200
		D (Clear beam)	0	0	1
Sampling Response Time (SRP) (Secs)			10	10	10
Averaged Ds (max)			0	1	2
Limit			*	*	*

Where * indicates the SOD must be ≤500 for floor coverings, ≤400 primary deck coverings, ≤400 plastic pipes and ≤200 for bulkhead, wall and ceiling linings.

** indicates time the maximum smoke density determined by the initial smoke density measurement test performed in each test condition. The gas measurement in each case is conducted at this pre-determined time.

Appendix II – Toxicity production during test

TOXICITY DATA Irradiance level of 25kW/m^2 in the presence of a pilot flame.

GAS		Maximum Gas Concentration *C* (ppm)		Average (ppm)	Limit (ppm)
		1	2		
Carbon Monoxide	CO	7	3	5	1450
Hydrochloric Acid	HCl	ND	ND	ND	N/A
	Correction Factor (*Cca*)	ND	ND	ND	
	Corrected max. conc.	ND	ND	ND	600
Hydrogen Bromide	HBr	ND	ND	ND	600
Hydrogen Fluoride	HF	ND	ND	ND	600
Hydrogen Cyanide	HCN	ND	ND	ND	140
Nitrous Fumes	NO_x	11	10	11	350
Sulphur Dioxide	SO_2	ND	ND	ND	*

TOXICITY DATA Irradiance level of 25kW/m^2 in the absence of a pilot flame.

GAS		Maximum Gas Concentration *C* (ppm)		Average (ppm)	Limit (ppm)
		1	2		
Carbon Monoxide	CO	ND	ND	ND	1450
Hydrochloric Acid	HCl	ND	ND	ND	N/A
	Correction Factor (*Cca*)	2	1	2	
	Corrected max. conc.	2	1	2	600
Hydrogen Bromide	HBr	ND	ND	ND	600
Hydrogen Fluoride	HF	ND	ND	ND	600
Hydrogen Cyanide	HCN	ND	ND	ND	140
Nitrous Fumes	NO_x	1	1	1	350
Sulphur Dioxide	SO_2	ND	ND	ND	*

TOXICITY DATA Irradiance level of 50kW/m^2 in the absence of a pilot flame.

GAS		Maximum Gas Concentration *C* (ppm)		Average (ppm)	Limit (ppm)
		1	2		
Carbon Monoxide	CO	4	3	4	1450
Hydrochloric Acid	HCl	ND	ND	ND	N/A
	Correction Factor (*Cca)*	1	1	1	
	Corrected max. conc.	1	1	1	600
Hydrogen Bromide	HBr	ND	ND	ND	600
Hydrogen Fluoride	HF	ND	ND	ND	600
Hydrogen Cyanide	HCN	ND	ND	ND	140
Nitrous Fumes	NO_x	1	1	1	350
Sulphur Dioxide	SO_2	ND	ND	ND	*

Key:
ND indicates non-detected.
* indicates the SO_2 must be ≤200 for floor coverings and the SO_2 must be ≤120 for other applications.

NB. Correction factor is the concentration of HCl gas retained on the filter throughout the complete test duration.

Appendix III – Observations during test

	25kW/m² In The Presence Of A Pilot Flame			25kW/m² In The Absence Of A Pilot Flame			50kW/m² In The Absence Of A Pilot Flame		
Specimen No.	1	2	3	4	5	6	7	8	9
Colour of smoke produced	Dark	Dark	Dark	Dark	Dark	Dark	Dark	Dark	Dark
Expansion distance towards heater (mm)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ignition time in seconds	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Extinction time in seconds	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Mass Loss (g)	0.00	0.90	0.50	0.40	0.60	0.40	0.80	0.60	0.60
Time to Ds (max)	1200	67	57	1200	1035	1091	1200	1193	1199
Ds (max)	1	0	0	1	1	1	1	2	2
D (Clear beam)	0	0	0	1	0	0	0	0	1
Test duration in seconds	1200	1200	1200	1200	1200	1200	1200	1200	1200
* = Did not re-ignite N/A = Not Applicable									

Revision History

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Revised By:	Approved By:
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