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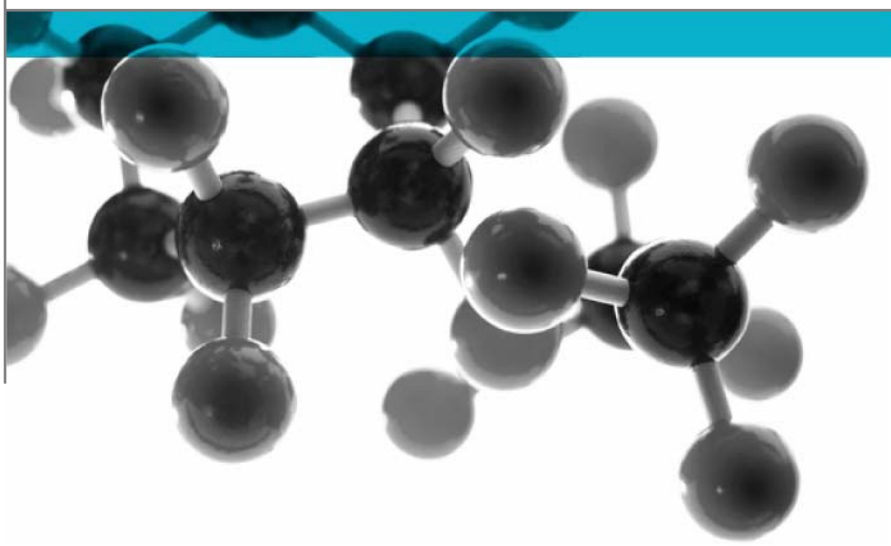
IMO Resolution A.653(16) As Amended By IMO Resolution MSC 61(67): Annex 1: Part 5



Surface Flammability

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

Document Reference: 308381

Date: 21st June 2011

Issue No.: 1

Testing
Advising
Assuring

UKAS TESTING
0249

Executive Summary

Objective

To determine the performance of the following product when tested in accordance with IMO Resolution A.653(16) as amended by IMO Resolution MSC 61(67): Annex 1: Part 5.

Generic Description	Product reference	Thickness	Weight per unit area, or density
A thermal insulation product adhered to a steel substrate	"K-Flex ST + IC Clad Silver"	26mm	9.20kg/m²*
Individual components used to manufacture composite:			
Foil facing	"K-Flex IC Clad Silver Foil"	0.20mm	204g/m²
Adhesive	Not stated	Not stated	60g/m²
Foam	"K-Flex ST"	25mm	55±10 kg/m³
Adhesive	Not stated	Unwilling to provide	Unwilling to provide
Substrate	Not stated	1mm	Between 7.5 to 10kg/m²
***Determined by Exova Warringtonfire**			
Please see page 5 of this test report for the full description of the product tested			

Test Sponsor

L'Isolante K-Flex S.r.l., Via Leonardo da Vinci 36, 20040 Roncello (MI), Italy

Summary of Test Results:

The specimens meet all the criteria given in the IMO document for bulkhead, wall and ceiling products and can therefore be considered to have low flame spread in compliance with the International Convention for the Safety of Life at Sea, 1974.

The Total Heat Release (Q_t) is not more than 0.2MJ and the Peak Heat Release Rate (Q_p) is not more than 1.0kW. Therefore, in accordance with Paragraph 2.2 of Annex 2 to IMO Resolution MSC 61(67), it is considered that the specimens covered by this report comply with the requirements of Part 2 of Annex 1 'Smoke and Toxicity Test' to IMO Resolution MSC 61(67), without further testing.

Date of Test

14th June 2011

Signatories

Responsible Officer
T. Mort *
Senior Technical Officer

Authorised
C. Dean *
Operations Manager

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

Report Issued: 21st June 2011

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Test Details

Purpose of test

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

The tests were performed in accordance with the procedure specified in IMO Resolution A653 (16) as amended by Resolution MSC 61 (67): Annex 1, Part 5 and it is advised that this report is read in conjunction with these documents.

Scope of test

International Maritime Organisation Resolution A653 (16) as amended by Resolution MSC 61 (67): Annex 1, Part 5 "Recommendation on Improved Fire Test Procedures for Surface Flammability of Bulkhead, Ceiling and Deck-Finish Materials", specifies a procedure for measuring fire characteristics of bulkhead, ceiling and deck finish materials as a basis for characterising their flammability and thus their suitability for use in maritime construction.

The Resolution specifies a method of test for measuring the lateral spread of flame along the surface of a specimen of a product orientated in the vertical position together with a method for determining the heat released by the specimen during exposure to a defined gradient of irradiance. It also details a classification system based on critical flux at extinguishment, heat for sustained burning, peak heat release rate and total heat release.

FTP Code / MSC/Circ. 1120

Certain aspects of the Fire Test Procedures (FTP) code are open to different interpretations. The Marine Stewardship Council (MSC) has identified a number of such areas and has issued amendments in MSC/Circ. 1120. The procedures in the FTP code and as amended by MSC/Circ. 1120 documents have been followed in this test procedure.

Instruction to test

The test was conducted on the 14th June 2011 at the request of L'Isolante K-Flex S.r.l., the sponsor of the test.

Conditioning of specimens

The specimens were received on the 10th June 2011.

Prior to test the specimens were conditioned to constant mass at a temperature of 23 ± 2°C and a relative humidity of 50 ± 10%.

Exposed face

The silver 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 foam was adhered to a 1mm thick steel substrate.

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.

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		A thermal insulation product comprising a foil faced foam adhered to a steel substrate
Overall product reference of composite		""K-Flex ST + IC Clad Silver"
Overall thickness of composite		26mm (stated by sponsor) 21.78mm (determined by **Exova Warringtonfire**)
Overall weight per unit area of composite		9.20kg/m² (determined by **Exova Warringtonfire**)
Foil	Product reference	"K-Flex IC Clad Silver Foil"
	Generic type	Glass filament fabric for coating and thermal/acoustic insulation
	Name of manufacturer	**See Note 1 below**
	Weight per unit area	204g/m²
	Thickness	0.20mm
	Colour	"Silver"
	Flame retardant details	**See Note 1 below**
Adhesive	Product reference	A product reference is not assigned to the adhesive
	Generic type	Acrylic emulsion PSA
	Name of manufacturer	ATP
	Application rate	60g/m²
	Application method	Calender
	Flame retardant details	**See Note 2 below**
Foam	Generic type	Elastomeric foam insulation (EN 14304-basis) nitrile rubber
	Product reference	"K-Flex ST"
	Name of manufacturer	L'Isolante K-Flex Srl Via Leonardo da Vinci, 36 20877 Roncello (MB) Italy
	Thickness	25mm
	Colour	Black
	Density	55 +/-10 kg/m³
	Flame retardant details	**See Note 1 below**
Adhesive	Product reference	"Loctite Super Glue"
	Generic type	Cyanoacrylate
	Name of manufacturer	Loctite
	Application rate	**See Note 1 below**
	Application method	**See Note 1 below**
	Flame retardant details	**See Note 1 below**

Substrate	Generic type	Steel
	Name of manufacturer	B.F.
	Thickness	1mm
	Weight per unit area	Between 7.5 to 10 kg/m²
	Flame retardant details	The substrate is inherently flame retardant
Brief description of manufacturing process of foam insulation		The sponsor of the test did not provide details relating to the manufacturing process of the foam insulation

Note 1. The sponsor of the test was unwilling 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.

Test Results

Test procedure

The test method involved mounting each conditioned specimen in a defined gradient of radiant flux and measuring the time to ignition, spread of flame, its final extinguishment distance together with a stack thermocouple signal as an indication of heat release by the specimen during burning.

Test results

Parameter	Units	Specimen Number					Average
		1	2	3	4	5	
Heat for Ignition (Q_i)	MJm^{-2}	*	*	N/A	N/A	N/A	*
Heat for Sustained Burning (Q_{sb})	MJm^{-2}	>30.3	>30.3	N/A	N/A	N/A	>30.3
Critical flux at Extinguishment (CFE)	kW/m^2	>50.5	>50.5	N/A	N/A	N/A	>50.5
Peak Heat Release Rate (q_p)	kW	N/A	N/A	0.64	0.62	0.71	0.7
Total Heat Release (Q_t)	MJ	N/A	N/A	0.12	0.13	0.18	0.1
Burning drops	N/A	N/A	N/A	N/A	N/A	N/A	N/A

***Unable to calculate due to insufficient flame travel**

Other test observations required by standard

Number of specimens tested	5
Type of pilot flame	Specimen No's 1 and 2 - non-impinging acetylene / air Specimen No's. 3, 4 and 5 - impinging acetylene / air

The test results relating to the spread of flame parameters for the individual specimens together with observations made during the test and comments on any difficulties encountered during the test are given in Appendix 1. The heat release data generated during each of the tests is given in Appendix 2.

Classification

Materials giving values for all the surface flammability criteria not exceeding those listed below are considered to meet the requirement for low flame spread in compliance with the regulations II - 2/3.29 and II-2/5.3.2.4 of the International Convention for the Safety of Life at Sea (SOLAS), 1974, and related Articles of Protocol 1998, as amended and consolidated in the 2004 publication of SOLAS.

Parameter	Requirement for bulkhead, wall & ceiling linings	Requirement for floor coverings
Heat for Sustained Burning	≥1.5 MJm^{-2}	≥0.25 MJm^{-2}
Critical flux at Extinguishment	≥20 kW/m^2	≥7.0 kW/m^2
Peak Heat Release Rate	≤4.0 kW	≤10.0 kW
Total Heat Release	≤0.7 MJ	≤2.0 MJ
Burning drops	Zero	≤10

Summary of Results

The specimens meet all the criteria given in the IMO document for bulkhead, wall and ceiling products and can therefore be considered to have low flame spread in compliance with the International Convention for the Safety of Life at Sea, 1974.

The Total Heat Release (Q_t) is not more than 0.2MJ and the Peak Heat Release Rate (Q_p) is not more than 1.0kW. Therefore, in accordance with Paragraph 2.2 of Annex 2 to IMO Resolution MSC 61(67), it is considered that the specimens covered by this report comply with the requirements of Part 2 of Annex 1 'Smoke and Toxicity Test' to IMO Resolution MSC 61(67), without further testing.

Note

In accordance with the provisions of SOLAS, 1974 and subsequent amendments, primary deck coverings, if applied within accommodation and service spaces and control stations, should be of approved materials which will not readily ignite, or give rise to toxic or explosive hazards at elevated temperatures. IMO Resolution A.687 (17) "Recommendation on Fire Test Procedures for Ignitability of Primary Deck Coverings" specifies a procedure for evaluating the ignitability of the primary deck coverings. Toxic and explosive hazards of the primary deck coverings should be verified to the satisfaction of the appropriate Administration.

Validity

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

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

The test results relate only to the specimens of the manufactured product in the form in which they are tested. 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 which were tested.

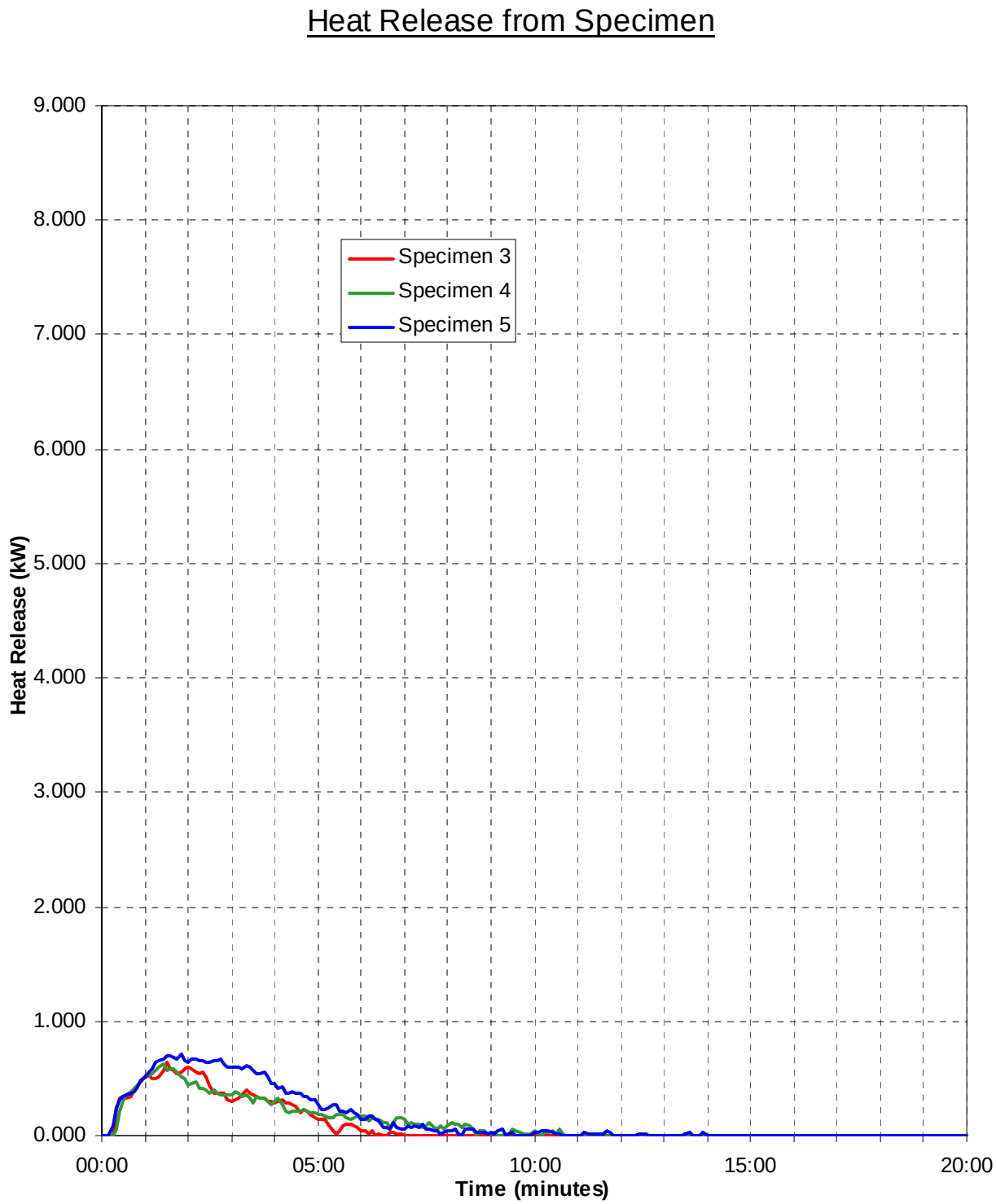
Appendix 1 – Observations during test

Specimen No:	1		Heat for Sustained Burning (MJ/m^2)	2		Heat for Sustained Burning (MJ/m^2)	3		Heat for Sustained Burning (MJ/m^2)	4		Heat for Sustained Burning (MJ/m^2)	5		Heat for Sustained Burning (MJ/m^2)
Time to Ignition: (min:sec)	Did not Ignite			Did not Ignite			00:05			00:06			00:08		
Time to Travel	min	sec		min	sec		min	sec		min	sec		min	sec	
50mm															
100mm															
150mm															
200mm															
250mm															
300mm															
350mm															
400mm															
450 mm															
500mm															
550mm															
600mm															
650mm															
700mm															
750mm															
800mm															
Duration of Test (min:sec)	10:00			10:00			09:30			17:00			16:17		
Final Travel (mm)	0			0			30			30			30		
CFE (kW/m^2)	>50.5			>50.5			N/A			N/A			N/A		

OBSERVATIONS:

NONE

Appendix 2 – Heat release from test specimens



Revision History

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

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