

Test Report

WARRES No. 135188

International Maritime Organisation
Resolution A653 (16) Fire Test Procedures
For Surface Flammability Of Bulkhead, Ceiling
And Deck Finish Materials As
Amended By Resolution MSC 61 (67)

Sponsored By

Venture Tape Corporation
30 Commerce Road
Rockland MA
02370
United States of America

Warrington
FIRE
research

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Summary

A test has been conducted in accordance with IMO Resolution A653(16) as amended by Resolution MSC 61 (67) on the specimens detailed in this report. The following calculated results were obtained:

| | |
|---------------------------------------|----------------------------|
| Critical flux at extinguishment (CFE) | = > 50.5 kW/m ² |
| Heat for sustained burning (Qsb) | = > 30.3 MJ/m ² |
| Total heat release (Qt) | = < 0.01 MJ |
| Peak heat release rate (Qp) | = < 0.01 kW |

In accordance with Annex 2 – Interpretations of the Fire Test Procedures Code of the International Maritime Organisation Sub-Committee on Fire Protection, 45th Session, Agenda Item 6 (Document Reference 45/6), the flame spread results (Critical Flux at Extinguishment and Heat For Sustained Burning) contained within this report relate to the two specimens which were initially tested with a non-impinging pilot flame and the heat release results (Total Heat Release and Peak Heat Release Rate) contained within this report relate to the three specimens which were tested with an impinging pilot flame.

The specimens meet all the criteria given in the IMO document 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).

Scope Of Test

International Maritime Organisation Resolution A653 (16) as amended by Resolution MSC 61 (67) "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.

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.

The product was a multi-layer laminate (product reference "Venture Clad Plus 1579"), having a total thickness of 350 microns, a total weight of 495g/m² and which was stated by the sponsor to be utilised as a weather resistant insulation jacketing for onshore and offshore applications.

The multi-layer laminate had one exposed aluminium foil face (test face), one reverse aluminium foil face and comprised six layers of aluminium foil, four layers of polyester film, one layer of HDPE fabric and two layers of LDPE film, laminated together utilising a PUR based adhesive.

The sponsor of the test has provided full construction details of the laminate but at the specific request of the sponsor, this information has been omitted from the test report and is held on our confidential file relating to this investigation.

In accordance with clause 7.4 of the resolution, the specimens were painted with a thin coat of a flat black paint prior to being conditioned for test.

The specimens were supplied by the sponsor. Warrington Fire Research Centre was not involved in any selection or sampling procedure.

Exposed Face

The exposed face (which was marked by the sponsor of the test) of the specimens was exposed to the radiant heat of the furnace when the specimens were mounted in the test position.

Conditioning Of Specimens

The specimens were received on the 3rd October 2003.

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

Date Of Test

The tests were performed on the 26th November 2003.

Test Procedure

The tests were performed in accordance with the procedure specified in IMO Resolution A653(16) as amended by Resolution MSC 61 (67), utilising an Acetylene/air pilot flame and it is advised that this report is read in conjunction with that document.

The test method involved mounting each conditioned specimen in a defined gradient of radiant flux (see Appendix I) 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.

Duration Of Test

The test is terminated when any one of the following is applicable;

- (i) The specimen fails to ignite after a 10 minute exposure.
- (ii) Three minutes have passed since all flaming from the specimen ceased.
- (iii) Flaming reaches the end of the specimen or self extinguishes and thus ceases to progress along the specimen. This criterion is only used when heat release measurements are not being made.
- (iv) In the case of floorcoverings, the test shall be terminated after 40 minutes.

Two specimens were initially tested, neither of which ignited following exposure for 10 minutes, therefore, in accordance with Clause 8.3.1 of the Resolution, a further specimen was tested with an impinging pilot flame. This specimen ignited, therefore, a further two specimens were required to be tested with an impinging pilot flame.

Test Results

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.

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 Table 1. The heat release data generated during each of the tests conducted with an impinging pilot flame (i.e. specimens No.3, No.4 and No.5) is given in Appendix II.

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 - 2/3.8, II-2/34 and II-2/49 of the International Convention for the Safety of Life at Sea (SOLAS), 1974, as amended.

| BULKHEAD, WALL AND CEILING LININGS | | | | FLOOR COVERINGS | | | |
|------------------------------------|-------------------|-------|-------|-------------------|-------------------|-------|--------|
| CFE | Qsb | Qt | Qp | CFE | Qsb | Qt | Qp |
| kw/m ² | MJ/m ² | MJ | kW | kw/m ² | MJ/m ² | MJ | kW |
| ≥ 20 | ≥ 1.5 | ≤ 0.7 | ≤ 4.0 | ≥ 7.0 | ≥ 0.25 | ≤ 2.0 | ≤ 10.0 |

Where CFE = Critical flux at extinguishment
 Qsb = Heat for sustained burning
 Qt = Total heat release
 Qp = Peak heat release rate

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.

The values calculated from the data in Table 1 and Appendix II for each specimen for each of the parameters above are as follows:

| PARAMETER | 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 | <0.01 | <0.01 | <0.01 | <0.01 |
| Total Heat Release (Q_t) (MJ) | N/A | N/A | <0.01 | <0.01 | <0.01 | <0.01 |

* Unable to calculate due to insufficient flame spread.

Comparison with the required criteria shows that the specimens described in this report meet all the requirements for low flame spread in compliance with the International Convention for the Safety of Life at Sea (SOLAS), 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).

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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Report By

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for and on behalf of
WARRINGTON FIRE RESEARCH CENTRE

Date of Issue : 10th December 2003

TABLE 1

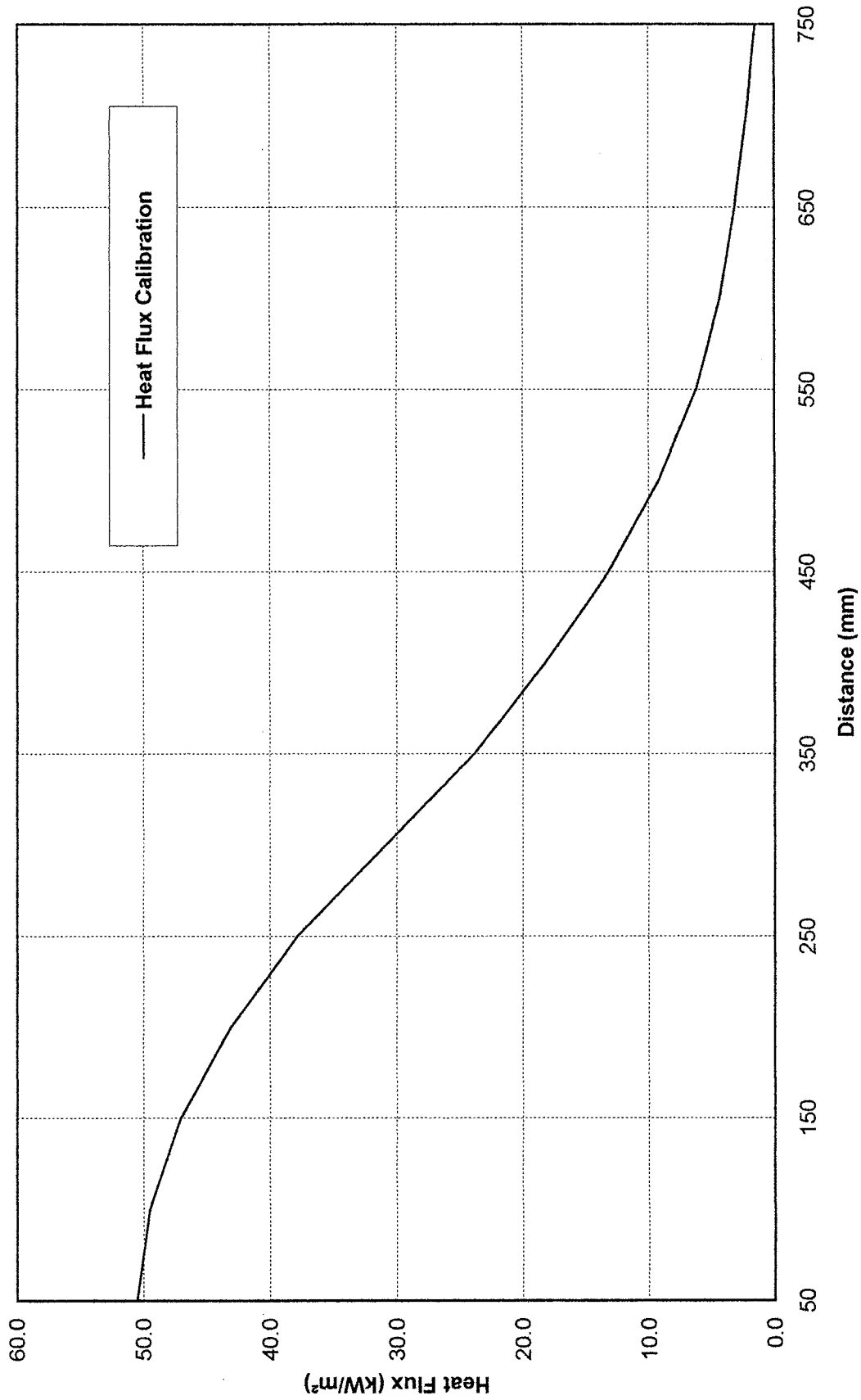
| Specimen No: | 1 | | Heat for Sustained Burning (MJ/m ²) | 2 | | Heat for Sustained Burning (MJ/m ²) | 3 | | Heat for Sustained Burning (MJ/m ²) | 4 | | Heat for Sustained Burning (MJ/m ²) | 5 | | Heat for Sustained Burning (MJ/m ²) |
|----------------------------|----------------|-----|---|----------------|-----|---|-------|-----|---|-------|-----|---|-------|-----|---|
| | Did not Ignite | | | Did not Ignite | | | 00:06 | | | 00:05 | | | 00:04 | | |
| | 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 | | | 04:37 | | | 05:38 | | | 06:58 | | |
| Final Travel (mm) | 0 | | | 0 | | | N/A | | | N/A | | | N/A | | |
| CFE (kW/m ²) | >50.5 | | | >50.5 | | | N/A | | | N/A | | | N/A | | |

OBSERVATIONS:

In accordance with clause 7.4 of the resolution, the specimens were painted with a thin coat of a flat black paint prior to being conditioned for test.

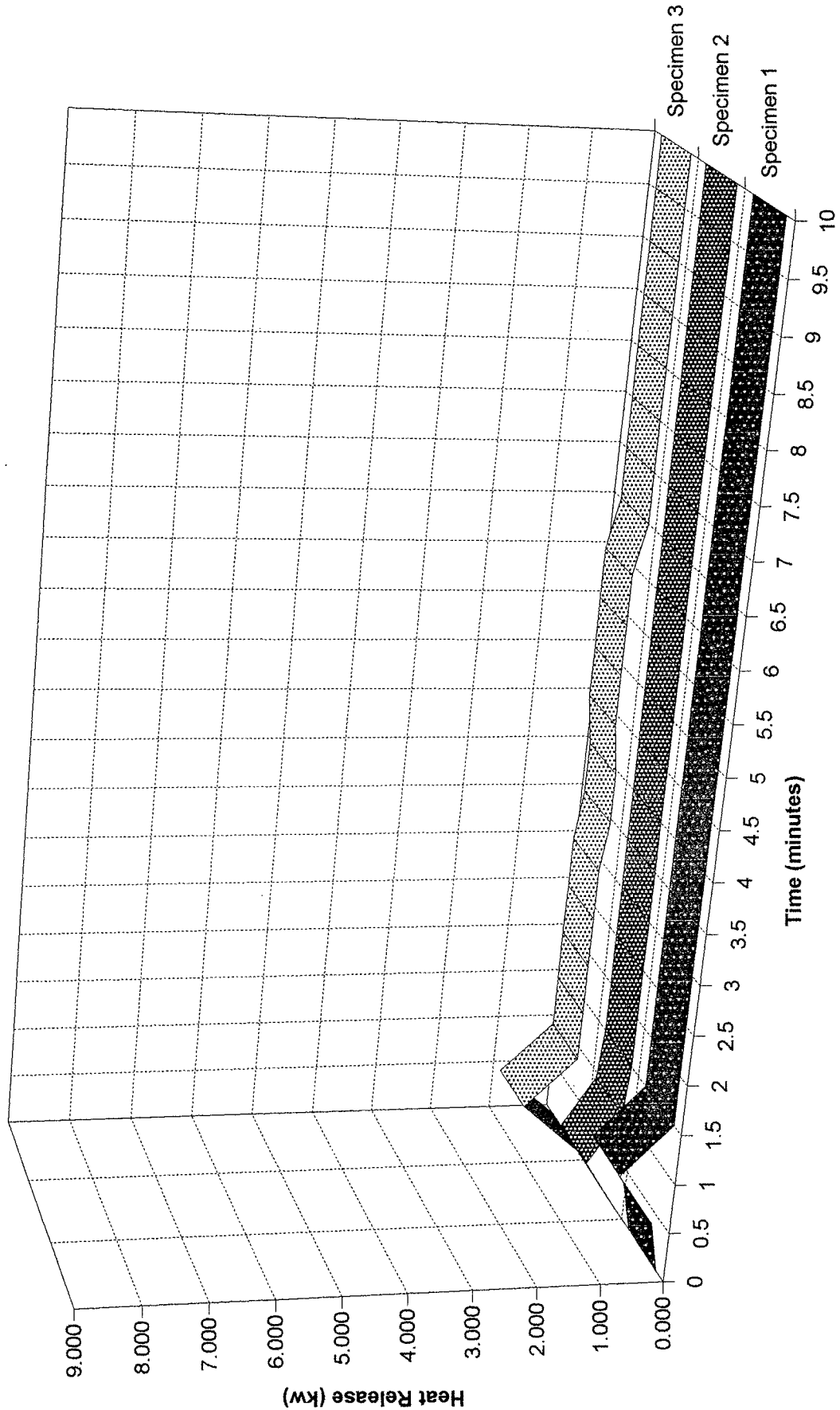
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APPENDIX I

Heat Release from Specimen



Heat Release (kw)



APPENDIX II