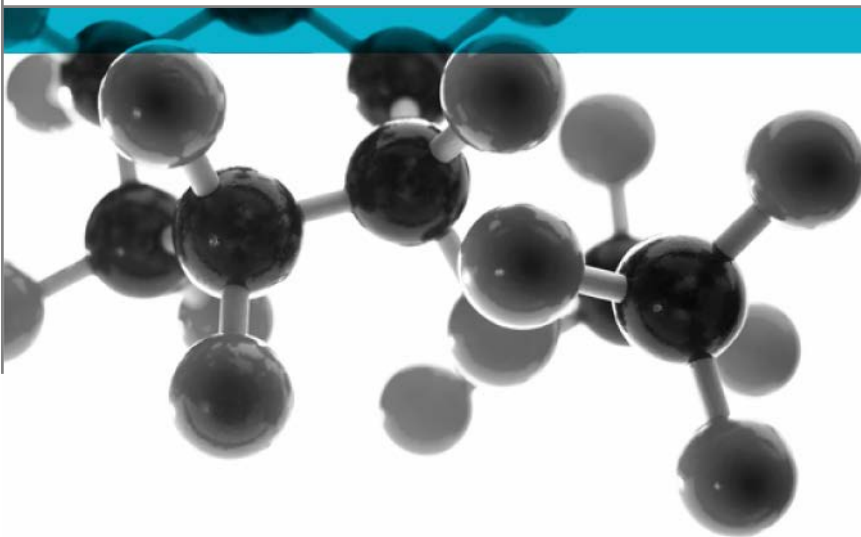


Exova Warringtonfire  
Holmesfield Road  
Warrington  
WA1 2DS  
United Kingdom

T : +44 (0) 1925 655116  
F : +44 (0) 1925 655419  
E : warrington@exova.com  
W: www.exova.com



# BS 476: Part 7: 1997



## Method For Classification Of The Surface Spread Of Flame Of Products

A Report To: Aludecor Lamination Pvt. Ltd.

Document Reference: 382603

Date: 10<sup>th</sup> May 2017

Issue No.: 2

Page 1

Testing  
Advising  
Assuring



## Executive Summary

**Objective** To determine the surface spread of flame classification of the following product when tested in accordance with BS 476: Part 7: 1997.

Generic Description	Product reference	Thickness / application rate	Weight per unit area or density
Fire rated aluminium composite panel	"ALUDECOR – Firewall"	3mm	5.2kg/m <sup>2</sup>
<b>Individual components used to manufacture composite:</b>			
Top coat	"AD31"	25g/m <sup>2</sup>	1.25kg/l
Primer	"PVDF Primer"	5.7g/m <sup>2</sup>	1.14kg/l
Aluminium	"AA 3105"	0.3mm	2.72g/cm <sup>3</sup>
Adhesive	"FR Adhesive Film"	65g/m <sup>2</sup>	Not stated
Core	"FR-E"	2.4mm	1.48g/cm <sup>3</sup>
Service coat	"Polyester"	11.97g/m <sup>2</sup>	1.26kg/l
<b>Please see pages 5 &amp; 6 of this test report for the full description of the product tested</b>			

**Test Sponsor** Aludecor Lamination Pvt. Ltd., I.R.N. Mukherjee Road, 5th Floor, Suite No.52, Kolkata 700 001, India


**Test Results:** **Class 1**

An uncertainty of measurement estimation has been conducted in relation to the distance travelled by the flame front and the findings are as detailed on page 9.


**Date of Test** 20<sup>th</sup> April 2017

**Reason for revision** This document replaces issue 1 (dated 8<sup>th</sup> May 2017) of the same number which has been withdrawn. The sampling information performed by **Warrington Certification Ltd.** has been included.

## Signatories



Responsible Officer  
C. Meachin \*  
Technical Officer



Authorised  
B. Dean \*  
Technical Leader

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

Report Issued: 10<sup>th</sup> May 2017

This version of the report has been produced from a pdf format electronic file that has been provided by **Exova Warringtonfire** to the sponsor of the report and must only be reproduced in full. Extracts or abridgements of reports must not be published without permission of **Exova Warringtonfire**.

<b>CONTENTS</b>	<b>PAGE NO.</b>
<b>EXECUTIVE SUMMARY .....</b>	<b>2</b>
<b>SIGNATORIES.....</b>	<b>2</b>
<b>TEST DETAILS.....</b>	<b>4</b>
<b>DESCRIPTION OF TEST SPECIMENS.....</b>	<b>5</b>
<b>TEST RESULTS .....</b>	<b>7</b>
<b>APPENDIX 1 – TEST RESULTS.....</b>	<b>8</b>
<b>APPENDIX 2 – CLASSIFICATION CRITERIA .....</b>	<b>10</b>
<b>REVISION HISTORY .....</b>	<b>11</b>



## Test Details

<b>Purpose of test</b>	To determine the performance of a product when it is subjected to the conditions of the test specified in BS 476: Part 7: 1997, "Fire tests on building materials and structures, method for classification of the surface spread of flame of products". This test was therefore performed in accordance with the procedure specified in BS 476: Part 7: 1997 and this report should be read in conjunction with that British Standard.
<b>Scope of test</b>	BS 476: Part 7: 1997 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, and a classification system based on the rate and extent of flame spread. It provides data suitable for comparing the performances of essentially flat materials, composites, or assemblies, which are used primarily as the exposed surfaces of walls or ceilings.
<b>Fire test study group/EGOLF</b>	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 have 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.
<b>Instruction to test</b>	The test was conducted on the 20 <sup>th</sup> April 2017 at the request of Aludecor Lamination Pvt. Ltd., the sponsor of the test.
<b>Provision of test specimens</b>	The specimens were sampled by a representative of <b>Warrington Certification Ltd.</b> and these specimens were then supplied by the sponsor of the test. <b>Exova Warringtonfire</b> was not involved in any selection or sampling procedure.
<b>Conditioning of specimens</b>	The specimens were received on the 13 <sup>th</sup> April 2017 and were conditioned to constant mass at a temperature of $23 \pm 2^{\circ}\text{C}$ and a relative humidity of $50 \pm 5\%$ prior to testing.
<b>Form in which the specimens were tested</b>	Composite - Combination of materials which are generally recognised in building constructions as discrete entities e.g. coated or laminated materials. Each specimen was tested in direct contact with a nominally 12mm thick non-combustible backing board.
<b>Exposed face</b>	The coated face of the specimens was exposed to the heating conditions of the test.

## 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		Fire rated aluminium composite panel
Product reference		"ALUDECOR – Firewall"
Name of manufacturer		Aludecor Lamination Pvt. Ltd.
Thickness		3mm (stated by sponsor) 3.09mm (determined by <b>Exova Warringtonfire</b> )
Weight per unit area		5.2kg/m <sup>2</sup> (stated by sponsor) 5.49kg/m <sup>2</sup> (determined by <b>Exova Warringtonfire</b> )
Product configuration		<ul style="list-style-type: none"> <li>• Top coat (test face)</li> <li>• Primer</li> <li>• Aluminium</li> <li>• Adhesive</li> <li>• Core</li> <li>• Adhesive</li> <li>• Aluminium</li> <li>• Service coat (back face)</li> </ul>
Top coat (Test face)	Generic type	PVDF
	Product reference	"AD31"
	Name of manufacturer	Nippon
	Colour reference	"Black"
	Number of coats	One
	Application rate per coat	25g/m <sup>2</sup>
	Density	1.25kg/l
	Application method	Coil coating
	Curing process per coat	Conventional oven
	Flame retardant details	<b>See Note 1 below</b>
First coat	Generic type	PVDF
	Product reference	"PVDF Primer"
	Name of manufacturer	Nippon
	Colour reference	"Yellow"
	Number of coats	One
	Application rate per coat	5.7g/m <sup>2</sup>
	Density	1.14kg/l
	Application method	Coil coating
	Curing process per coat	Conventional oven
	Flame retardant details	<b>See Note 1 below</b>

Continued on next page

Aluminium	Generic type	Mill Finish Aluminium Coil
	Product reference	"AA 3105"
	Detailed description / composition details	Manganese Alloy for Architectural Usage
	Name of manufacturer	Hindalco
	Thickness	0.3mm
	Density	2.72g/cm <sup>3</sup>
	Colour reference	"Mill Finish"
	Flame retardant details	This component is inherently flame retardant
Adhesive	Generic type	Low Density Polyethylene and Ethylene Acrylate Polymer mix
	Product reference	"FR Adhesive Film"
	Name of manufacturer	Ecoplast Ltd.
	Colour reference	"Semi-Translucent"
	Application rate	65g/m <sup>2</sup>
	Application method	Hot roll lamination
	Flame retardant details	<b>See Note 1 below</b>
	Curing process	<b>See Note 1 below</b>
Core	Generic type	Magnesium Di Hydroxide
	Product reference	"FR-E"
	Detailed description / composition details	<b>See Note 2 below</b>
	Name of manufacturer	Aludecor Lamination Pvt. Ltd.
	Thickness	2.4mm
	Density	1.48g/cm <sup>3</sup>
	Colour reference	"Off White"
	Trade name of flame retardant	"MDH"
	Generic type of flame retardant	Magnesium Di Hydroxide
Amount of flame retardant	<b>See Note 2 below</b>	
Service coat (Back face)	Generic type	Polyester service coat
	Product reference	"Polyester"
	Name of manufacturer	PPG
	Colour reference	"Light Grey"
	Number of coats	One
	Application rate per coat	11.97g/m <sup>2</sup>
	Density	1.26kg/l
	Application method	Coil coating
	Curing process per coat	Conventional oven
Flame retardant details	<b>See Note 1 below</b>	
Brief description of manufacturing process		There are three processes involve in the production off aluminium composite panel 1 – Pre-treatment of Aluminium Coil 2 – Aluminium Coil Colour Coating 3 – Lamination of Colour Coated Aluminium Coil with Fire Rated Core

**Note 1: The sponsor was unable to provide this information.**

**Note 2: 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.**

## Test Results

---

### Results and observations

The test results 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.

### Classification

**In accordance with the class definitions given in BS 476: Part 7: 1997; the specimens tested are classified as Class 1.**

**An uncertainty of measurement estimation has been conducted in relation to the distance travelled by the flame front and the findings are as detailed on page 9.**

### Criteria for classification

If the prefix 'D' or suffix 'R' or 'Y' is included in the classification, this indicates that the results should be treated with caution. An explanation of the reason for the prefix and suffixes is given in Appendix 2, together with the classification limits specified in the Standard.

### Applicability of test result

The test results relate only to the behaviour of the test specimens of the product under the particular conditions of 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 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 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.

### 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.

This report may only be reproduced in full. Extracts or abridgements shall not be published without permission of **Exova Warringtonfire**.

## Appendix 1 – Test Results

SPECIMEN No.	1	2	3	4	5	6
Maximum distance travelled at 1.5 minutes (mm)	<50	<50	<50	<50	<50	<50
Distance (mm)	Time to travel to indicated distance (minutes : seconds)					
75						
165						
190						
215						
240						
265						
290						
375						
455						
500						
525						
600						
675						
710						
750						
785						
825						
Time to reach maximum distance travelled	1:00	1:00	1:00	1:00	1:00	1:00
Maximum distance travelled in 10 minutes (mm)	<50	<50	<50	<50	<50	<50

Note: Six specimens are usually tested. If the test on any specimen is deemed to be invalid, as defined in the Standard, it is permissible for up to a maximum of nine specimens to be tested in order to obtain the six valid test results.

### Observations made during test and comments on any difficulties encountered during the test:

In the case of each specimen tested all sustained flaming ceased after 1:00

In the case of each specimen tested the coatings on the surface of the product began to crack and delaminate from the sixth minute of the test extending up to a maximum distance of 75mm at the end of the test.



**Uncertainty of measurement**

Specimen No.	1	2	3	4	5	6
Maximum distance travelled at 1.5 minutes (mm)	±0	±0	±0	±0	±0	±0
Maximum distance travelled in 10 minutes (mm)	±0	±0	±0	±0	±0	±0

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor  $k=2$ , providing a coverage probability of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

## Appendix 2 – Classification Criteria

### Classification of spread of flame

Classification	Spread of Flame at 1.5 min		Final Spread of Flame	
	Limit (mm)	Limit for one specimen (mm)	Limit (mm)	Limit for one specimen (mm)
Class 1	165	165 + 25	165	165 + 25
Class 2	215	215 + 25	455	455 + 45
Class 3	265	265 + 25	710	710 + 75
Class 4	Exceeding the limits for class 3			

### Explanation of prefix and suffixes which may be added to the classification

1. A suffix R is added to the classification if more than six specimens are required in order to obtain six valid test results (e.g. class 2R).
2. A prefix D is added to the classification of any product which does not comply with the surface characteristics specified in the Standard and has therefore been tested in a modified form (e.g. class D3).
3. A suffix Y is added to the classification if any softening and/or other behaviour that may affect the flame spread occurs (e.g. class 3Y).

For example, a classification of D3RY could be achieved indicating (a) a modified surface has been used; (b) a class 3 result has been obtained; (c) additional specimens have been used to obtain 6 valid results and; (d) softening and/or other behaviour has occurred which is considered to have affected the test result.

## Revision History

Issue No : 2	Re-issue Date: 10 <sup>th</sup> May 2017
Revised By: C. Meachin	Approved By: S. Deeming
Reason for Revision: This document replaces issue 1 (dated 8 <sup>th</sup> May 2017) of the same number which has been withdrawn. The sampling information performed by <b>Warrington Certification Ltd.</b> has been included.	

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