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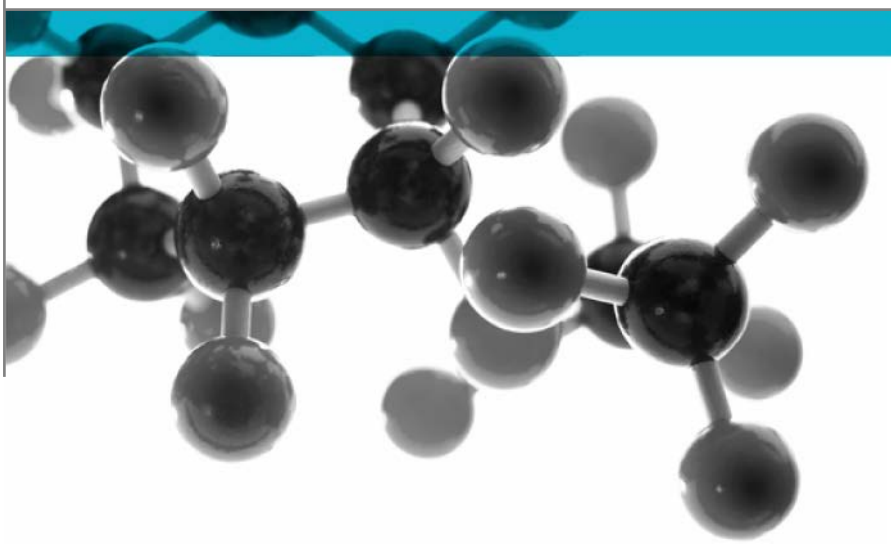
BS 476: Part 6: 1989+A1:2009



Method Of Test For
Fire Propagation For Products

A Report To: AFS Boru Sanayi A.S.

Document Reference: 403637

Date: 28th August 2018

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 BS 476: Part 6: 1989+A1: 2009.

Generic Description	Product reference	Thickness	Weight per unit area or application rate
Flexible ducting product	"COMBIAFS"	150 microns	300g/m² ± 10%
Individual components used to manufacture composite:			
Aluminium foil (test face)	"Aluminium"	9 microns	2.72g/cm³
Adhesive	Confidential	Not applicable	Unwilling to provide
Polyester film	"Polyester"	12 microns	1.40g/m³
PVC (reverse face)	"PVC"	Confidential	Confidential
Please see page 5 of this test report for the full description of the product tested			

Test Sponsor

AFS Boru Sanayi A.S., Ivedik Organize Sanayi Bolgesi, No. 1468, Cadde No:153, Ostim, Ankara 06370, Turkey

Test Results:

Fire propagation index, I = 4.6

Sub index, i_1 = 4.1

Sub index, i_2 = 0.5

Sub index, i_3 = 0.0

An uncertainty of measurement estimation has been conducted in relation to the fire propagation index, I and the sub index, i_1. The findings are as detailed in Annex A of this report.

Date of Test

22nd August 2018

Signatories

Responsible Officer
T. Mort *
Senior Technical Officer

Authorised
S. Deeming *
Business Unit Head

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

Report Issued: 28th August 2018

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Test Details

Purpose of test

To determine the performance of a product when it is subjected to the conditions of the test specified in BS 476: Part 6: 1989+A1: 2009, "Fire tests on building materials and structures, method for fire propagation for products".

The test was performed in accordance with the procedure specified in BS 476: Part 6: 1989+A1: 2009, and this report should be read in conjunction with that British Standard.

Scope of test

BS 476: Part 6: 1989+A1: 2009 specifies a method of test, the result being expressed as a fire propagation index, that provides a comparative measure of the contribution to the growth of fire made by an essentially flat material, composite or assembly. It is primarily intended for the assessment of the performance of internal wall and ceiling linings.

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 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.

Instruction to test

The test was conducted on the 22nd August 2018 at the request of AFS Boru Sanayi A.S, 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.

Conditioning of specimens

The specimens for testing to BS 476: Part 6: 1989+A1: 2009 together with the specimens for testing to BS 476: Part 7: 1997 were received on the 1st February 2018.

Prior to the tests, all of the specimens were conditioned to constant mass at a temperature of 23 ± 2°C and a relative humidity of 50 ± 5%. One specimen from the total sample submitted for test was selected for constant mass verification.

Form in which the specimens were tested

Assembly - Fabrication of materials and/or composites that can contain air gaps. An air space was provided at the back of the product by testing over spacers of non-combustible insulation board 20 mm wide and 12.5mm thick.

Exposed face

The aluminium foil 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. This information has not been independently verified by **Exova Warringtonfire.**

All values quoted are nominal, unless tolerances are given.

General description		Flexible ducting product. The sponsor has stated that in practice the product tested is used to form a cylindrical duct that incorporates a reinforcing steel wire helix
Product reference		"COMBIAFS"
Name of manufacturer		AFS BORU SANAYI A.S.
Overall weight per unit area		300 g/m^2 ± 10% (stated by sponsor) 297.09g/m² (determined by **Exova Warringtonfire**)
Overall thickness		150 micron (stated by sponsor) 0.76mm (determined by **Exova Warringtonfire**)
Product configuration		• Aluminium foil • Adhesive • Polyester film • Adhesive • Aluminium foil • Adhesive • Polyester film • Adhesive • Aluminium foil • PVC
Aluminium foil (test face)	Product reference	"Aluminium"
	Generic type	Aluminium
	Name of manufacturer	**See Note 1 below**
	Density	2.72g/cm^3
	Thickness	9 microns
	Flame retardant details	**See Note 2 below**
Adhesive	Product reference	**See Note 3 below**
	Generic type	**See Note 3 below**
	Name of manufacturer	**See Note 1 below**
	Thickness	**See Note 4 below**
	Application rate	**See Note 1 below**
	Flame retardant details	**See Note 2 below**
Polyester film	Product reference	"Polyester"
	Generic type	Polyester
	Name of manufacturer	**See Note 1 below**
	Density	1.40g/m^3
	Thickness	12 microns
	Flame retardant details	**See Note 4 below**

Continued on next page

PVC film (reverse face)	Product reference	"PVC"
	Generic type	Polyvinyl chloride (PVC) film
	Name of manufacturer	**See Note 1 below**
	Weight per unit area	**See Note 3 below**
	Thickness	**See Note 3 below**
	Flame retardant details	**See Note 4 below**
Brief description of manufacturing process		**See Note 1 below**

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.

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.

Note 4. The sponsor of the test was unable to provide this information.

Test Results

Results

A total of three specimens were tested. The laboratory record sheet relating to each of the test specimens is appended to this report (refer to Tables 1, 2 and 3).

Throughout the test on each specimen careful observation was made of the product's behaviour within the apparatus and special note was taken of any of the phenomena listed in clause 9.2 of the Standard. None of the listed phenomena was observed and the test results on all three specimens tested were valid.

The following test results were obtained for the product.

Fire propagation index, I	**=**	**4.6**
Sub index, i_1	**=**	**4.1**
Sub index, i_2	**=**	**0.5**
Sub index, i_3	**=**	**0.0**

An uncertainty of measurement estimation has been conducted in relation to the fire propagation index, I and the sub index, i_1. The findings are as detailed in Annex A of this report.

NOTE: If a suffix 'R' is included in the above fire propagation index, I, then this indicates that the results should be treated with caution.

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.

Table 1

Laboratory Record Sheet

FIRE PROPAGATION TEST - BS476:PART 6:1989+A1:2009

Specimen No. : 1 **Date : 22-Aug-18**

Time mins t	Specimen Temperature Deg C Ts	Calibration Temperature Deg C Tc	Ts-Tc/10t	Sub Index Of Performance
0.50	20	13	1.40	
1.00	29	20	0.90	
1.50	34	24	0.67	
2.00	39	29	0.50	
2.50	43	34	0.36	
3.00	50	38	0.40	4.23
4.00	78	70	0.20	
5.00	116	110	0.12	
6.00	155	141	0.23	
7.00	169	162	0.10	
8.00	183	181	0.03	
9.00	196	192	0.04	
10.00	205	205	0.00	0.72
12.00	220	222	0.00	
14.00	231	234	0.00	
16.00	239	239	0.00	
18.00	244	244	0.00	
20.00	245	256	0.00	0.00
Total Index of Performance S			**=**	**4.95**

SubIndex s1 **4.23**

SubIndex s2 **0.72**

SubIndex s3 **0.00**

Index of Performance S **4.95**

Table 2

Laboratory Record Sheet

FIRE PROPAGATION TEST - BS476:PART 6:1989+A1:2009

Specimen No. : 2 **Date : 22-Aug-18**

Time mins t	Specimen Temperature Deg C Ts	Calibration Temperature Deg C Tc	Ts-Tc/10t	Sub Index Of Performance
0.50	19	13	1.20	
1.00	27	20	0.70	
1.50	34	24	0.67	
2.00	39	29	0.50	
2.50	44	34	0.40	
3.00	49	38	0.37	3.83
4.00	80	70	0.25	
5.00	117	110	0.14	
6.00	145	141	0.07	
7.00	164	162	0.03	
8.00	181	181	0.00	
9.00	194	192	0.02	
10.00	203	205	0.00	0.51
12.00	220	222	0.00	
14.00	229	234	0.00	
16.00	238	239	0.00	
18.00	244	244	0.00	
20.00	248	256	0.00	0.00
Total Index of Performance S			**=**	**4.34**

SubIndex s1 **3.83**

SubIndex s2 **0.51**

SubIndex s3 **0.00**

Index of Performance S **4.34**

Table 3

Laboratory Record Sheet

FIRE PROPAGATION TEST - BS476:PART 6:1989+A1:2009

Specimen No. : 3 **Date : 22-Aug-18**

Time mins t	Specimen Temperature Deg C Ts	Calibration Temperature Deg C Tc	Ts-Tc/10t	Sub Index Of Performance
0.50	20	13	1.40	
1.00	28	20	0.80	
1.50	34	24	0.67	
2.00	39	29	0.50	
2.50	43	34	0.36	
3.00	50	38	0.40	4.13
4.00	80	70	0.25	
5.00	117	110	0.14	
6.00	144	141	0.05	
7.00	165	162	0.04	
8.00	182	181	0.01	
9.00	194	192	0.02	
10.00	206	205	0.01	0.53
12.00	220	222	0.00	
14.00	231	234	0.00	
16.00	237	239	0.00	
18.00	244	244	0.00	
20.00	248	256	0.00	0.00
Total Index of Performance S			**=**	**4.65**

SubIndex s1 **4.13**

SubIndex s2 **0.53**

SubIndex s3 **0.00**

Index of Performance S **4.65**

Annex A

Uncertainty of measurement

Specimen No.	1	2	3	Average
Fire propagation index, I	±0.77	±0.77	±0.77	±0.77
Sub index i_1	±0.76	±0.76	±0.76	±0.76

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.

Revision History

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

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Revised By:	Approved By:
Reason for Revision:	