



BS 476: Part 7: 1997

Method For Classification Of The Surface Spread Of Flame Of Products

WF Report Number

164170

Date:

24th August 2009

Test Sponsor:

Kingspan Insulation Limited





Bodycote warringtonfire Report No. 164170

BS 476: Part 7: 1997 Method For Classification Of The Surface Spread Of Flame Of Products

Sponsored By

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CONTENTS	PAGE NO.
TEST DETAILS	4
DESCRIPTION OF TEST SPECIMENS	5
TEST RESULTS	7
SIGNATORIES	8
APPENDIX 1	10
APPENDIX 2	
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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 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.

Scope of test

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.

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 10th May 2007 at the request of Kingspan Insulation Limited, the sponsor of the test.

Provision of test specimens

The specimens were supplied by the sponsor of the test. **Bodycote warringtonfire** was not involved in any selection or sampling procedure.

Conditioning of specimens

The specimens for testing to BS 476: Part 6: 1989 together with the specimens for testing to BS 476: Part 7: 1997 were received on the 2nd March 2007.

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

Form in which the specimens were tested

Composite

Exposed face

The foil face of the specimens was exposed to the heating conditions of the test.





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Description of Test Specimens

No information regarding the composition of the specimens was received at the time of the test and the sponsor did not require a formal report at that time. The sponsor has subsequently provided the following description of the specimens and has requested that a report be issued. All values quoted are nominal, unless tolerances are given.

Gene	eral description		A perforated reinforced aluminium foil				
333.3. addd.ipadi.			composite which was tested stapled to				
			calcium silicate based board. The sponsor of the test has stated that the				
			facing is utilised on products referenced				
			"Koolduct" and "Kooltherm"				
Prod	uct reference		"W439 – 25 Micron With 5x5 Scrim"				
			(Internal Code "KYN18")				
Thick	kness		0.5mm (determined by Bodycote				
_			warringtonfire)				
Over	all weight per un	it area	176g/m² (stated by sponsor)				
			168.7g/m ² (determined by Bodycote				
	Duad wat water		warringtonfire)				
	Product reference		"Coated Foil"				
	Name of manufa	acturer	See Note 1 below				
	Thickness		25.4 microns				
	Weight per unit		See Note 2 below				
		Product reference	See Note 2 below				
		Generic type	See Note 2 below				
	Coating	Name of manufacturer	See Note 2 below				
	- Code.ii.g	Application rate / thickness	See Note 2 below				
		Application method	See Note 2 below				
==		Flame retardant details	See Note 2 below				
ğ	Foil	Product reference	See Note 2 below				
om o		Generic type	Aluminium foil				
Ö		Name of manufacturer	See Note 2 below				
Aluminium foil composite		Density / weight per unit area	See Note 2 below				
E E		Thickness	See Note 2 below				
ini		Colour	"Silver" (observed by Bodycote				
l I			warringtonfire)				
A		Flame retardant details	See Note 2 below				
	Glass reinforcement	Product reference	See Note 2 below				
		Generic type	Glass fibre net				
		Name of manufacturer	See Note 2 below				
		Weight per unit area	See Note 2 below				
		Thickness	See Note 2 below				
		Colour	"White" (observed by Bodycote				
			warringtonfire)				
		Cell diameter	5mm				
		Flame retardant details	See Note 2 below				

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			,
	Adhesive	Product reference	See Note 2 below
iţe		Generic type	See Note 2 below
		Name of manufacturer	See Note 2 below
SOS		Application rate	See Note 2 below
composite ed)		Application method	See Note 2 below
		Flame retardant details	See Note 2 below
Aluminium foil cor (continued)	Glass mat	Product reference	"Backing Mat"
표 등		Generic type	Fiberglass mat
اتا ک		Name of manufacturer	See Note 2 below
Ē		Weight per unit area	49g/m ²
Alt.		Thickness	See Note 2 below
		Colour	See Note 2 below
		Flame retardant details	See Note 2 below
		Trade name	"Promat Brandschutzbauplatten Promatect"
	Generic type		Calcium silicate based board
	Cubatrata	Name of supplier	Promat
	Substrate	Thickness	12mm
	Weight per unit area		870kg/m ³
		Flame retardant details	Non combustible
Brief description of manufacturing process			See Note 2 below

Note 1. 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 2. The sponsor of the test was unable to provide this information.

The sponsor has confirmed that some of the components were manufactured by other parties. They have also confirmed that they were not able to obtain from the manufacturers some details that would normally be included in Bodycote warringtonfire test reports. The description of the specimens given above is therefore, not as complete as would normally be the case for descriptions included in Bodycote warringtonfire test reports, and the description may not fully comply with the requirements of the standard. In all other respects, however, the tests were conducted fully in accordance with the requirements of the standard and the test results are valid.





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 Table 1.

Classification

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

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 1, together with the irradiance along the horizontal reference line of the specimen position during the test and 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.

Attention is drawn to Appendix 2 entitled "Effect of thermal characteristics on the performance of assemblies".

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.

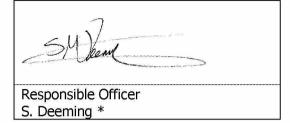
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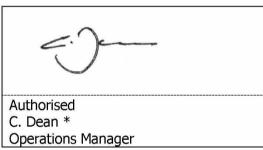


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Signatories







* For and on behalf of **Bodycote warringtonfire**.

Report Issued: 24th August 2009

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Table 1

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		indicated dist : seconds)	ance	
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:

None





Appendix 1

Irradiance along the horizontal reference line of	Distance along reference line from the hotter end of the specimen position (mm)	75	225	375	525	675	825
the specimen position during the test	Irradiance at points specified above (kW/m²)	32.5	21.0	14.5	10.0	7.0	5.0

Note: A tolerance of \pm 0.5 kW/m² is specified on the irradiance measurement

Classification of
spread of flame

	Spread of F	lame at 1.5 min	Final Spre	Final Spread of Flame		
Classification	Limit (mm)	Limit for one specimen (mm)	Limit (mm)	Limit for one specimen (mm)		
Class 1 Class 2 Class 3	165 215 265	165 + 25 215 + 25 265 + 25	165 455 710	165 + 25 455 + 45 710 + 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.





Appendix 2

Effect of thermal characteristics on the performance of specimens

The result of the test in accordance with BS 476: Part 7: 1997 is applicable only to the specimens 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 result. It is important that the specimens which are tested fully represent the product which is supplied and the manner in which it will be used. This may require a product to be tested in a number of different ways to determine the classification which will be achieved in its different methods of use.

A surface coating, for example, may be applied to a selected substrate using a particular method and application rate. The test classification which is achieved for that set of specimens will be applicable only to that situation. If the substrate or method and rate of application in a particular practical situation are different from that which was tested, then it will be necessary to determine the classification which will be achieved for that situation. Similarly, specimens incorporating a wallcovering must be fully representative of the situation which occurs in practice and will normally consist of the wallcovering bonded to a chosen substrate with a chosen adhesive; the test result will only apply to that composite system. The same principle applies to any composite or assembly which is being investigated.

It is sometimes possible to assume a `worst case' situation which will enable a chosen set, or sets, of specimens to be constructed and tested to provide a foundation for the assessment of the probable performance of variations within the system. Similarly, it is sometimes possible to formulate a series of exploratory tests to investigate the effect of variations within a product or system, usually culminating in a series of formal tests to provide the basis for a composite assessment of pre-determined variables. In such cases, however, it is essential that careful planning of the programmes is undertaken by suitably qualified fire safety practitioners.

The following is re-produced from Appendix B of BS 476: Part 7: 1997;

With thin materials or composites, particularly those with a high thermal conductivity, the presence of an air gap and the nature of any underlying construction may significantly affect the ignition performance of the exposed surface. Increasing the thermal capacity of the underlying construction increases the "heat sink" effect and may delay ignition of the exposed surface. Any backing provided to the test specimen and in intimate contact with it, such as the non-combustible spacers, may alter this "heat sink" effect and may be fundamental to the test result itself. The influence of the underlying layers on the performance of the assembly should be understood and care should be taken to ensure that the result obtained on any assembly is relevant to its use in practice.





The following advice is offered on the construction and preparation of test specimens;

- (a) Where the thermal properties of the product are such that no significant heat loss to the underlying layers can occur, e.g. a material or composite greater than approximately 6 mm thick of high thermal capacity and/or low thermal conductivity, then the product should be tested backed only by the backing board.
- (b) Where the product is normally used as a free-standing sheet and the characteristics noted in (a) do not apply, then an air space should be provided at the back of the product by testing over spacers of non-combustible insulation board 20 mm wide and (25 ± 1) mm thick.
- (c) Where the product is to be used over a low density non-combustible substrate and the characteristics noted in (a) do not apply, then the product should be tested in conjunction with that substrate.
- (d) Where the product is to be used over a combustible substrate and the characteristics noted in (a) do not apply, then the product should be tested in conjunction with that substrate.

NOTE: Discussions are taking place in ISO/TC92/SC1 concerning the possible use of a restricted range of reference substrates (mainly non-combustible) where it is not apparent or possible to test materials or products in the representative end-use substrate.







