Test Report

WARRES No. 122847

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

Sponsored By

Hilti Entwicklungsgesellschaft mbH
Bereich NE – Installation
Hiltistrasse 2
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Germany

Warrington FIRE research

(LJL9347W)

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1 Purpose Of Test

To determine the classification of specimens of a product when they are tested in accordance with BS 476: Part 7: 1997, "Fire tests on building materials and structures, method for classification of the surface spread of flame of products".

2 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.

3 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 specimens comprised an aluminium foil laminate faced polyurethane foam board, stated by the sponsor to be representative of the pipe insulation used in the 'M1 – CF refrigeration pipe ring' installation.

The specimens comprised a 50mm thick H – CFC and CFC free polyurethane foam (product referenced 'Bauder PUR – T, M1, R G 80', manufacturer Paul Bauder GmbH & Co.), having a density of 80kg/m^3, faced with an aluminium foil laminate (product referenced 'Dreifachverbund Alu/PET/Alu – 25/12/9', manufacturer Rump Foilen GmbH), bonded utilising 'Ecomelt Al Ex 188' adhesive.

Further details of the composition of the product have been provided and are held on the confidential file relating to this investigation.

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

4 Conditioning Of Specimens

The specimens were received on the 15th January 2002.

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

5 **Date Of Test**

The test was performed on the 21st January 2002.

6 **Test Procedure**

The test was 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.

7 **Form In Which The Specimens Were Tested**

The specimens were tested in the form of a composite.

8 **Exposed Face**

The aluminium foil face of the specimens was exposed to the radiant heat of the test when the specimens were mounted in the test position.

9 **Test Results And Classification**

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.

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.

IN ACCORDANCE WITH THE CLASS DEFINITIONS GIVEN IN BS 476: PART 7: 1997, THE SPECIMENS TESTED ARE CLASSIFIED AS CLASS 1.

Note: 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.

10 **Interpretation Of Test Results**

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

11 **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.

Responsible Officer

J COAKLEY
Technical Officer -
Reaction to Fire Testing

Approved

C DEAN
Laboratory Supervisor - Testing Department
Reaction to Fire Testing
For and on behalf of
WARRINGTON FIRE RESEARCH CENTRE

Date Of Issue : 09 April 2002

(LJL9347W)

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 to travel to indicated distance (minutes, seconds)					
75						
165						
190						
215						
240						
265						
290						
375						
455						
500						
525						
600						
675						
710						
750						
785						
825						
900						
Time to reach maximum distance travelled (minutes, seconds)	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 the specimen position during the test.

Distance along reference line from the hotter end of the specimen position (in mm)	75	225	375	525	675	825
Irradiance at points specified above (kW/m^2)	32.5	21.0	14.5	10.0	7.0	5.0

Note: a tolerance of ± 0.5 kW/m^2 is specified on the irradiance measurement.

Classification of spread of flame

CLASSIFICATION	SPREAD OF FLAME AT 1.5 MIN		FINAL SPREAD OF FLAME	
	LIMIT	LIMIT FOR ONE SPECIMEN IN SAMPLE	LIMIT	LIMIT FOR ONE SPECIMEN IN SAMPLE
	mm	mm	mm	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.

Appendix 2
Effect of Thermal Characteristics on the Performance of Specimens

The result of the test in accordance with BS 476: Part 7: 1987 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.