Test Report

WARRES No. 122848

BS 476: Part 6: 1989
Method Of Test For
Fire Propagation For Products

Sponsored By

Hilti Entwicklungsgesellschaft mbH
Bereich NE – Installation
Hiltistrasse 2
86915 Kaufering
Germany

Warrington FIRE research

(LJL9346W)

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1 Purpose Of Test

To determine the fire propagation index of specimens of a product when they are tested in accordance with BS 476: Part 6: 1989 'Fire tests on building materials and structures, method of test for fire propagation for products'.

2 Scope Of Test

BS 476: Part 6: 1989 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.

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 testing 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 23rd & 24th Janurary 2002.

6 Test Procedure

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

7 Form In Which 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 heating conditions of the test.

9 Test Results

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.

A total of three specimens was tested. The laboratory record sheet relating to each of the test specimens is appended to this report.

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 10.2 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	=	8.9
subindex, i_1	=	4.2
subindex, i_2	=	4.2
subindex, i_3	=	0.5

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.

10 Interpretation Of Test Results

Attention is drawn to Appendix 1, 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

(LJL9346W)

Appendix 1

Effect of Thermal Characteristics on the Performance of Assemblies

The result of a test in accordance with BS 476: Part 6: 1989 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 apply only 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 6: 1989:

> 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 packing pieces, 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/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 specimen holder.
>
> (b) Where the product is normally used as a free-standing sheet and the characteristics noted in (a) do not apply, then an airspace should be provided at the back of the product by testing over asbestos cement perimeter battens 20 mm wide and 12.5 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.

Laboratory Record Sheet

FIRE PROPAGATION TEST - B.S.476:PART 6:1989

Sponsor : Hilti Entwicklungsgesellschaft mbH

Specimen No : 1

Date : 23/01/02

Time mins t	Specimen Temperature Deg C Ts	Calibration Temperature Deg C Tc	Ts-Tc/10t	Sub Index Of Performance
0.50	27	13	2.80	
1.00	30	18	1.20	
1.50	35	25	0.67	
2.00	40	29	0.55	
2.50	45	33	0.48	
3.00	51	36	0.50	6.20
4.00	89	73	0.40	
5.00	158	109	0.98	
6.00	202	142	1.00	
7.00	231	162	0.99	
8.00	258	179	0.99	
9.00	263	195	0.76	
10.00	250	204	0.46	5.57
12.00	228	218	0.08	
14.00	221	229	0.00	
16.00	214	236	0.00	
18.00	203	243	0.00	
20.00	194	247	0.00	0.08
Total Index of Performance S			=	11.85

SubIndex s_1 6.20

SubIndex s_2 5.57

SubIndex s_3 0.08

Index of Performance S 11.85

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Laboratory Record Sheet

FIRE PROPAGATION TEST - B.S.476:PART 6:1989

Sponsor : Hilti Entwicklungsgesellschaft mbH

Specimen No : 2

Date : 23/01/02

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	23	18	0.50	
1.50	29	25	0.27	
2.00	35	29	0.30	
2.50	38	33	0.20	
3.00	42	36	0.20	2.67
4.00	72	73	0.00	
5.00	109	109	0.00	
6.00	139	142	0.00	
7.00	189	162	0.39	
8.00	224	179	0.56	
9.00	246	195	0.57	
10.00	257	204	0.53	2.04
12.00	264	218	0.38	
14.00	264	229	0.25	
16.00	265	236	0.18	
18.00	267	243	0.13	
20.00	257	247	0.05	1.00
Total Index of Performance S			=	5.71

SubIndex s_1 2.67

SubIndex s_2 2.04

SubIndex s_3 1.00

Index of Performance S 5.71

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Laboratory Record Sheet

FIRE PROPAGATION TEST - B.S.476:PART 6:1989

Sponsor : Hilti Entwicklungsgesellschaft mbH

Specimen No : 3

Date : 24/01/02

Time mins t	Specimen Temperature Deg C Ts	Calibration Temperature Deg C Tc	Ts-Tc/10t	Sub Index Of Performance
0.50	21	13	1.60	
1.00	25	18	0.70	
1.50	31	25	0.40	
2.00	37	29	0.40	
2.50	42	33	0.36	
3.00	46	36	0.33	3.79
4.00	84	73	0.28	
5.00	142	109	0.66	
6.00	195	142	0.88	
7.00	228	162	0.94	
8.00	253	179	0.93	
9.00	264	195	0.77	
10.00	269	204	0.65	5.10
12.00	253	218	0.29	
14.00	229	229	0.00	
16.00	213	236	0.00	
18.00	200	243	0.00	
20.00	191	247	0.00	0.29
Total Index of Performance S			=	9.19

SubIndex s_1 3.79

SubIndex s_2 5.10

SubIndex s_3 0.29

Index of Performance S 9.19

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