



BS 476: Part 6: 1989

Method Of Test For Fire Propagation For Products

WF Report Number

164169

Date:

24th August 2009

Test Sponsor:

Kingspan Insulation Limited





Bodycote warringtonfire Test Report No. 164169

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

Sponsored By

Kingspan Insulation Limited
Pembridge
Leominster
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HR6 9LA





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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, "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, and this report should be read in conjunction with that British Standard.

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.

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 has 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 10^{th} & 11^{th} 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.





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.

A perioduct reference composite which was tested stapled to calcium silicate based board. The sponsor of the test has stated that the facing is utilised on products reference composite which was tested stapled to calcium silicate based board. The sponsor of the test has stated that the facing is utilised on products reference composite with the sponsor of the test has stated that the facing is utilised on products reference composite with the sponsor of the test has stated that the facing is utilised on products reference composite with the sponsor of the test has stated that the facing is utilised on products reference with the sponsor of the test has stated that the facing is utilised on products reference by Warringtonfire) Product reference composite with the sponsor of the test has stated that the facing is utilized on products reference by Warringtonfire) Product reference composite with the sponsor of the test has stated that the facing is utilized on products reference by Warringtonfire) Product reference composite with the facing is utilized on products reference composite with the facing is utilized on products reference composite with the facing is utilized on products reference composite with the facing is utilized on products reference composite with the facing is utilized on products reference composite with the facing is utilized on products reference composite with the facing is utilized on product reference composite with the facing is utilized on product reference composite with the facing is utilized on product reference composite with the facing is utilized on product reference composite with the facing is utilized on product reference composite with the facing is utilized on product reference composite with the facing is utilized on product reference composite with the facing is utilized on product reference composite with the facing is utilized on product reference composite with the facing is utilized on product reference composite with the facing is utilized on product reference compo	Cono	ral description		A perforated reinforced aluminium foil	
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Flame retardant details See Note 2 below			Cell diameter		
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		Mrs. Mrs. on	
		Product reference	See Note 2 below
		Generic type	See Note 2 below
iţe	Adhesive	Name of manufacturer	See Note 2 below
composite ed)	Adilesive	Application rate	See Note 2 below
¥ €		Application method	See Note 2 below
	1	Flame retardant details	See Note 2 below
ium foil cor (continued)		Product reference	"Backing Mat"
표 등		Generic type	Fiberglass mat
Aluminium foil (continu	Glass mat	Name of manufacturer	See Note 2 below
		Weight per unit area	49g/m ²
		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
	Cubetrata	Name of supplier	Promat
Substrate		Thickness	12mm
		Weight per unit area	870kg/m³
		Flame retardant details	Non combustible
Brief	description of m	anufacturing 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.





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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	=	3.5
Sub index, i ₁	=	2.2
Sub index, i ₂		1.1
Sub index, i₃	=	0.2

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 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.

Attention is drawn to Appendix 1, entitled 'Effect of thermal characteristics on the performance of assemblies'.

Validity

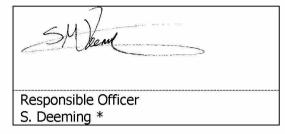
The specification and interpretation of fire test methods are the subject of ongoing development and refinement. Changes in associated legislation may also occur. For these reasons it is recommended that the relevance of test reports over five years old should be considered by the user. The laboratory 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.

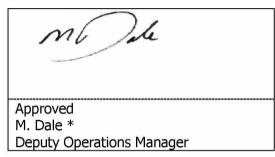
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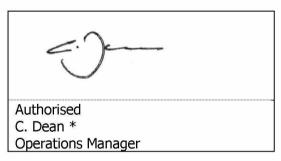




Signatories







^{*} For and on behalf of **Bodycote warringtonfire**.

Report Issued: 24th August 2009

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Table 1

Laboratory Record Sheet

FIRE PROPAGATION TEST - BS 476: PART 6: 1989

Specimen No.: 1 Date: 10-May-07

Time mins t	Specimen Temperature Deg C Ts	Calibration Temperature Deg C Tc	Ts- Tc/10t	Sub Index Of Performance
0.50 1.00 1.50 2.00 2.50 3.00 4.00 5.00 6.00 7.00 8.00 9.00 10.00 12.00 14.00 16.00 18.00 20.00	15 21 25 31 35 39 74 108 135 153 169 184 193 206 218 226 230 237	12 16 20 25 29 33 65 97 125 143 159 173 184 199 211 219 224 230	0.60 0.50 0.33 0.30 0.24 0.20 0.23 0.22 0.17 0.14 0.13 0.12 0.09 0.06 0.05 0.04 0.03 0.04	2.17 1.09
1	Total Index of Per	formance S	=	3.49

SubIndex s1	2.17
SubIndex s2	1.09
SubIndex s3	0.22
Index of Performance S	3.49





Table 2

Laboratory Record Sheet

FIRE PROPAGATION TEST - BS 476: PART 6: 1989

Specimen No.: 2 Date: 10-May-07

Time mins	Specimen Temperature Deg C Ts	Calibration Temperature Deg C Tc	Ts- Tc/10t	Sub Index Of Performance
0.50 1.00 1.50 2.00 2.50 3.00 4.00 5.00 6.00 7.00 8.00 9.00 10.00 14.00 16.00 18.00 20.00	15 20 26 31 35 40 71 107 134 153 169 181 191 206 216 224 229 233	12 16 20 25 29 33 65 97 125 143 159 173 184 199 211 219 224 230	0.60 0.40 0.40 0.30 0.24 0.23 0.15 0.20 0.15 0.14 0.13 0.09 0.07 0.06 0.04 0.03 0.03 0.02	0.93
7	Total Index of Per	formance S	=	3.27

SubIndex s1	2.17
SubIndex s2	0.93
SubIndex s3	0.17
Index of Performance S	3 27





Laboratory Record Sheet

FIRE PROPAGATION TEST - BS 476: PART 6: 1989

Specimen No.: 3 Date: 11-May-07

Time mins t	Specimen Temperature Deg C Ts	Calibration Temperature Deg C Tc	Ts- Tc/10t	Sub Index Of Performance
0.50 1.00 1.50 2.00 2.50 3.00 4.00 5.00 6.00 7.00 8.00	15 21 27 31 36 40 74 107 133 154 169	12 16 20 25 29 33 65 97 125 143 159	0.60 0.50 0.47 0.30 0.28 0.23 0.23 0.20 0.13 0.16 0.13	2.38
9.00 10.00 12.00 14.00 16.00 18.00 20.00	183 192 206 218 224 230 236	173 184 199 211 219 224 230	0.11 0.08 0.06 0.05 0.03 0.03	0.20
1	Total Index of Pe	formance S	=	3.61

SubIndex s1	2.38
SubIndex s2	1.03
SubIndex s3	0.20
Index of Performance S	3.61





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Appendix 1

Effect of thermal characteristics on the performance of specimens

The result of a test in accordance with BS 476: Part 6: 1989+A1: 2009 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 6: 1989+A1: 2009:

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.





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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 non-combustible 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.







