

Test Report

WARRES No. 139327

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

Sponsored By

Bute Fabrics  
Rothesay  
Isle of Bute  
PA20 0DP

**W**arrington  
**FIRE**  
*research*

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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 a flame retardant treated, decorative fabric (product reference "CF 667/2222 Elgin", Batch Number "17231/01"), having two identical faces, bonded to one face of 12.5mm thick calcium silicate board utilising a PVA adhesive.

The fabric was stated by the sponsor to have a thickness of 1mm, an overall weight of 395kg/m<sup>2</sup> and to comprise an 82% pure new wool / 8% nylon fabric which had been impregnated with flame retardant chemicals utilising the 'IWS ZIPRO' flame retardant treatment process.

The sponsor was unable to provide further details of the 'IWS ZIPRO' flame retardant treatment process.

The specimens were supplied by the sponsor. Warrington Fire Research Centre was not involved in any selection or sampling procedure. Warrington Fire Research Centre supplied the adhesive and the calcium silicate sheet substrate and bonded the composite together.

4 Conditioning Of Specimens

The specimens were received on the 23<sup>rd</sup> April 2004.

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 14<sup>th</sup> May 2004.

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 fabric 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	=	10.0
subindex, $i_1$	=	4.4
subindex, $i_2$	=	4.9
subindex, $i_3$	=	0.7

**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.

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Responsible Officer

T MORT  
Acting Technical Officer  
Reaction to Fire Testing

Approved

P E LYTHGOE  
Testing Manager  
Reaction to Fire Testing  
for and on behalf of  
WARRINGTON FIRE RESEARCH CENTRE

Date Of Issue: 26<sup>th</sup> May 2204

## 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 : Bute Fabrics

Specimen No : 1

Date : 13/05/2004

Time mins  t	Specimen Temperature Deg C Ts	Calibration Temperature Deg C Tc	Ts-Tc/10t	Sub Index Of Performance
0.50	21	14	1.40	4.20
1.00	28	21	0.70	
1.50	34	25	0.60	
2.00	42	29	0.65	
2.50	45	33	0.48	
3.00	48	37	0.37	
4.00	93	67	0.65	5.14
5.00	168	105	1.26	
6.00	188	132	0.93	
7.00	212	154	0.83	
8.00	222	168	0.68	
9.00	227	184	0.48	
10.00	227	195	0.32	
12.00	233	211	0.18	0.60
14.00	237	218	0.14	
16.00	242	226	0.10	
18.00	251	233	0.10	
20.00	254	238	0.08	
Total Index of Performance S			=	

SubIndex s<sub>1</sub> 4.20SubIndex s<sub>2</sub> 5.14SubIndex s<sub>3</sub> 0.60

Index of Performance S 9.94

**Laboratory Record Sheet****FIRE PROPAGATION TEST - B.S.476:PART 6:1989**

Sponsor : Bute Fabrics

Specimen No : 2

Date : 14/05/2004

Time mins  t	Specimen Temperature Deg C Ts	Calibration Temperature Deg C Tc	Ts-Tc/10t	Sub Index Of Performance
0.50	21	14	1.40	4.26
1.00	29	21	0.80	
1.50	35	25	0.67	
2.00	40	29	0.55	
2.50	45	33	0.48	
3.00	48	37	0.37	
4.00	91	67	0.60	4.47
5.00	166	105	1.22	
6.00	178	132	0.77	
7.00	199	154	0.64	
8.00	213	168	0.56	
9.00	219	184	0.39	
10.00	224	195	0.29	0.62
12.00	231	211	0.17	
14.00	237	218	0.14	
16.00	245	226	0.12	
18.00	251	233	0.10	
20.00	257	238	0.10	
Total Index of Performance S			=	9.35

SubIndex s<sub>1</sub> 4.26SubIndex s<sub>2</sub> 4.47SubIndex s<sub>3</sub> 0.62

Index of Performance S 9.35

**Laboratory Record Sheet****FIRE PROPAGATION TEST - B.S.476:PART 6:1989**

Sponsor : Bute Fabrics

Specimen No : 3

Date : 14/05/2004

Time mins  t	Specimen Temperature Deg C Ts	Calibration Temperature Deg C Tc	Ts-Tc/10t	Sub Index Of Performance
0.50	21	14	1.40	4.59
1.00	29	21	0.80	
1.50	36	25	0.73	
2.00	43	29	0.70	
2.50	47	33	0.56	
3.00	49	37	0.40	
4.00	81	67	0.35	5.31
5.00	175	105	1.40	
6.00	195	132	1.05	
7.00	215	154	0.87	
8.00	226	168	0.73	
9.00	232	184	0.53	
10.00	233	195	0.38	
12.00	242	211	0.26	0.87
14.00	245	218	0.19	
16.00	252	226	0.16	
18.00	256	233	0.13	
20.00	263	238	0.13	
Total Index of Performance S			=	10.77

SubIndex s<sub>1</sub> 4.59SubIndex s<sub>2</sub> 5.31SubIndex s<sub>3</sub> 0.87

Index of Performance S 10.77



Test Report

WARRES No. 139326

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

Sponsored By

Bute Fabrics  
Rothesay  
Isle of Bute  
PA20 0DP

**W**arrington  
**FIRE**  
*research*

4 **Conditioning Of Specimens**

The specimens were received on the 23<sup>rd</sup> April 2004.

Prior to test the specimens were conditioned to constant mass at a temperature of  $23 \pm 2^{\circ}\text{C}$  and a relative humidity of  $50 \pm 10\%$ .

5 **Date Of Test**

The test was performed on the 13<sup>th</sup> May 2004.

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 decorative 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.

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Responsible Officer

**T MORT**  
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**P E LYTHGOE**  
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**WARRINGTON FIRE RESEARCH CENTRE**

Date Of Issue : 26<sup>th</sup> May 2004

Table 1

SPECIMEN No.	1	2	3	4	5	6
Maximum distance travelled at 1.5 minutes (mm)	60	60	60	60	60	60
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	1;00	1:00	1:00	1:00	1:00	1:00
Maximum distance travelled in 10 minutes (mm)	60	60	60	60	60	60

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.