

*test report*

**Bodycote**

**BS 476: Part 6: 1989**

**Method Of Test For  
Fire Propagation For Products**

**WF Report Number**

**164169**

**Date:**

**24<sup>th</sup> 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  
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## Test Details

<b>Purpose of test</b>	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.
<b>Scope of test</b>	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.
<b>Fire test study group/EGOLF</b>	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.
<b>Instruction to test</b>	The test was conducted on the 10 <sup>th</sup> & 11 <sup>th</sup> May 2007 at the request of Kingspan Insulation Limited, the sponsor of the test.
<b>Provision of test specimens</b>	The specimens were supplied by the sponsor of the test. <b>Bodycote warringtonfire</b> was not involved in any selection or sampling procedure.
<b>Conditioning of specimens</b>	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 2 <sup>nd</sup> March 2007.
	Prior to the tests, all of the specimens were conditioned to constant mass at a temperature of $23 \pm 2^\circ\text{C}$ and a relative humidity of $50 \pm 5\%$ . One specimen from the total sample submitted for test was selected for constant mass verification.
<b>Form in which the specimens were tested</b>	Composite
<b>Exposed face</b>	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.

General description		A perforated reinforced aluminium foil 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"	
Product reference		"W439 – 25 Micron With 5x5 Scrim" (Internal Code "KYN18")	
Thickness		0.5mm (determined by <b>Bodycote warringtonfire</b> )	
Overall weight per unit area		176g/m <sup>2</sup> (stated by sponsor) 168.7g/m <sup>2</sup> (determined by <b>Bodycote warringtonfire</b> )	
Aluminium foil composite	Product reference	"Coated Foil"	
	Name of manufacturer	<b>See Note 1 below</b>	
	Thickness	25.4 microns	
	Weight per unit area	<b>See Note 2 below</b>	
	Coating	Product reference	<b>See Note 2 below</b>
		Generic type	<b>See Note 2 below</b>
		Name of manufacturer	<b>See Note 2 below</b>
		Application rate / thickness	<b>See Note 2 below</b>
		Application method	<b>See Note 2 below</b>
		Flame retardant details	<b>See Note 2 below</b>
	Foil	Product reference	<b>See Note 2 below</b>
		Generic type	Aluminium foil
		Name of manufacturer	<b>See Note 2 below</b>
		Density / weight per unit area	<b>See Note 2 below</b>
		Thickness	<b>See Note 2 below</b>
		Colour	"Silver" (observed by <b>Bodycote warringtonfire</b> )
		Flame retardant details	<b>See Note 2 below</b>
	Glass reinforcement	Product reference	<b>See Note 2 below</b>
		Generic type	Glass fibre net
		Name of manufacturer	<b>See Note 2 below</b>
		Weight per unit area	<b>See Note 2 below</b>
Thickness		<b>See Note 2 below</b>	
Colour		"White" (observed by <b>Bodycote warringtonfire</b> )	
Cell diameter		5mm	
Flame retardant details		<b>See Note 2 below</b>	

Continued on next page

Aluminium foil composite (continued)	Adhesive	Product reference	<b>See Note 2 below</b>
		Generic type	<b>See Note 2 below</b>
		Name of manufacturer	<b>See Note 2 below</b>
		Application rate	<b>See Note 2 below</b>
		Application method	<b>See Note 2 below</b>
		Flame retardant details	<b>See Note 2 below</b>
	Glass mat	Product reference	"Backing Mat"
		Generic type	Fiberglass mat
		Name of manufacturer	<b>See Note 2 below</b>
		Weight per unit area	49g/m <sup>2</sup>
		Thickness	<b>See Note 2 below</b>
		Colour	<b>See Note 2 below</b>
		Flame retardant details	<b>See Note 2 below</b>
Substrate	Trade name	"Promat Brandschutzbauplatten Promatect"	
	Generic type	Calcium silicate based board	
	Name of supplier	Promat	
	Thickness	12mm	
	Weight per unit area	870kg/m <sup>3</sup>	
	Flame retardant details	Non combustible	
Brief description of manufacturing process		<b>See Note 2 below</b>	

**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

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.

<b>Fire propagation index, I</b>	<b>=</b>	<b>3.5</b>
<b>Sub index, i<sub>1</sub></b>	<b>=</b>	<b>2.2</b>
<b>Sub index, i<sub>2</sub></b>	<b>=</b>	<b>1.1</b>
<b>Sub index, i<sub>3</sub></b>	<b>=</b>	<b>0.2</b>

**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


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Responsible Officer  
S. Deeming \*



Approved  
M. Dale \*  
Deputy Operations Manager



Authorised  
C. Dean \*  
Operations Manager

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

*Report Issued: 24<sup>th</sup> 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
<b>0.50</b>	<b>15</b>	<b>12</b>	<b>0.60</b>	
<b>1.00</b>	<b>21</b>	<b>16</b>	<b>0.50</b>	
<b>1.50</b>	<b>25</b>	<b>20</b>	<b>0.33</b>	
<b>2.00</b>	<b>31</b>	<b>25</b>	<b>0.30</b>	
<b>2.50</b>	<b>35</b>	<b>29</b>	<b>0.24</b>	
<b>3.00</b>	<b>39</b>	<b>33</b>	<b>0.20</b>	<b>2.17</b>
<b>4.00</b>	<b>74</b>	<b>65</b>	<b>0.23</b>	
<b>5.00</b>	<b>108</b>	<b>97</b>	<b>0.22</b>	
<b>6.00</b>	<b>135</b>	<b>125</b>	<b>0.17</b>	
<b>7.00</b>	<b>153</b>	<b>143</b>	<b>0.14</b>	
<b>8.00</b>	<b>169</b>	<b>159</b>	<b>0.13</b>	
<b>9.00</b>	<b>184</b>	<b>173</b>	<b>0.12</b>	
<b>10.00</b>	<b>193</b>	<b>184</b>	<b>0.09</b>	<b>1.09</b>
<b>12.00</b>	<b>206</b>	<b>199</b>	<b>0.06</b>	
<b>14.00</b>	<b>218</b>	<b>211</b>	<b>0.05</b>	
<b>16.00</b>	<b>226</b>	<b>219</b>	<b>0.04</b>	
<b>18.00</b>	<b>230</b>	<b>224</b>	<b>0.03</b>	
<b>20.00</b>	<b>237</b>	<b>230</b>	<b>0.04</b>	<b>0.22</b>
<b>Total Index of Performance S</b>			<b>=</b>	<b>3.49</b>

**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 t	Specimen Temperature Deg C Ts	Calibration Temperature Deg C Tc	Ts- Tc/10t	Sub Index Of Performance
<b>0.50</b>	<b>15</b>	<b>12</b>	<b>0.60</b>	
<b>1.00</b>	<b>20</b>	<b>16</b>	<b>0.40</b>	
<b>1.50</b>	<b>26</b>	<b>20</b>	<b>0.40</b>	
<b>2.00</b>	<b>31</b>	<b>25</b>	<b>0.30</b>	
<b>2.50</b>	<b>35</b>	<b>29</b>	<b>0.24</b>	
<b>3.00</b>	<b>40</b>	<b>33</b>	<b>0.23</b>	<b>2.17</b>
<b>4.00</b>	<b>71</b>	<b>65</b>	<b>0.15</b>	
<b>5.00</b>	<b>107</b>	<b>97</b>	<b>0.20</b>	
<b>6.00</b>	<b>134</b>	<b>125</b>	<b>0.15</b>	
<b>7.00</b>	<b>153</b>	<b>143</b>	<b>0.14</b>	
<b>8.00</b>	<b>169</b>	<b>159</b>	<b>0.13</b>	
<b>9.00</b>	<b>181</b>	<b>173</b>	<b>0.09</b>	
<b>10.00</b>	<b>191</b>	<b>184</b>	<b>0.07</b>	<b>0.93</b>
<b>12.00</b>	<b>206</b>	<b>199</b>	<b>0.06</b>	
<b>14.00</b>	<b>216</b>	<b>211</b>	<b>0.04</b>	
<b>16.00</b>	<b>224</b>	<b>219</b>	<b>0.03</b>	
<b>18.00</b>	<b>229</b>	<b>224</b>	<b>0.03</b>	
<b>20.00</b>	<b>233</b>	<b>230</b>	<b>0.02</b>	<b>0.17</b>
<b>Total Index of Performance S</b>			<b>=</b>	<b>3.27</b>

**SubIndex s1                      2.17**

**SubIndex s2                      0.93**

**SubIndex s3                      0.17**

**Index of Performance S        3.27**

**Table 3**

**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
<b>0.50</b>	<b>15</b>	<b>12</b>	<b>0.60</b>	
<b>1.00</b>	<b>21</b>	<b>16</b>	<b>0.50</b>	
<b>1.50</b>	<b>27</b>	<b>20</b>	<b>0.47</b>	
<b>2.00</b>	<b>31</b>	<b>25</b>	<b>0.30</b>	
<b>2.50</b>	<b>36</b>	<b>29</b>	<b>0.28</b>	
<b>3.00</b>	<b>40</b>	<b>33</b>	<b>0.23</b>	<b>2.38</b>
<b>4.00</b>	<b>74</b>	<b>65</b>	<b>0.23</b>	
<b>5.00</b>	<b>107</b>	<b>97</b>	<b>0.20</b>	
<b>6.00</b>	<b>133</b>	<b>125</b>	<b>0.13</b>	
<b>7.00</b>	<b>154</b>	<b>143</b>	<b>0.16</b>	
<b>8.00</b>	<b>169</b>	<b>159</b>	<b>0.13</b>	
<b>9.00</b>	<b>183</b>	<b>173</b>	<b>0.11</b>	
<b>10.00</b>	<b>192</b>	<b>184</b>	<b>0.08</b>	<b>1.03</b>
<b>12.00</b>	<b>206</b>	<b>199</b>	<b>0.06</b>	
<b>14.00</b>	<b>218</b>	<b>211</b>	<b>0.05</b>	
<b>16.00</b>	<b>224</b>	<b>219</b>	<b>0.03</b>	
<b>18.00</b>	<b>230</b>	<b>224</b>	<b>0.03</b>	
<b>20.00</b>	<b>236</b>	<b>230</b>	<b>0.03</b>	<b>0.20</b>
<b>Total Index of Performance S</b>			<b>=</b>	<b>3.61</b>

**SubIndex s1                      2.38**

**SubIndex s2                      1.03**

**SubIndex s3                      0.20**

**Index of Performance S        3.61**

## 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.

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.



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