



## CERTIFICATE OF PRODUCT CONFORMITY

Dubai Central Laboratory Department (DCLD) of Dubai Municipality,  
hereby attests that the product(s):

### FACTORY-MADE PHENOLIC FOAM PRODUCTS

(Details as per the attached Scope of Certification)

manufactured by:

### KINGSPAN INSULATION LIMITED

Torr Vale Industrial Estate, Pembroke, Leominster  
Herefordshire, HR6 9LA, United Kingdom

have been assessed in accordance with DCLD Document Ref. No. RD-DP21-2001 (IC) "General Rules for DM third party product certification system through factory assessment" and the relevant Specific Rules, and were found in conformity with the standard specification:

**BS EN 13166:2015**

Accordingly, DCLD hereby authorizes the above manufacturer  
to affix the DCL Product Conformity Mark to the above-mentioned product(s).

ENGR. HAWA ABDULLA BASTAKI  
Executive Director, Dubai Central Laboratory Department  
Dubai Municipality



Certificate No: CL16020337  
Valid Until: 02 March 2017



Current Issue Date: 03 March 2016  
Original Issue Date: 03 March 2016

The attached Scope of Certification bearing the same Certificate No. forms an integral part of this certificate.  
This certificate is subject to the Terms and Conditions of the Product Certification System  
and shall not be reproduced except in full.

**DUBAI CENTRAL LABORATORY DEPARTMENT**  
**DCL PRODUCT CONFORMITY CERTIFICATION SCHEME**

**SCOPE OF CERTIFICATION**  
**FOR CERTIFICATE NO. CL16020337**

**Certificate Issued To:** KINGSPAN INSULATION LIMITED  
Torvale Industrial Estate, Pembridge, Leominster  
Herefordshire, HR6 9LA, United Kingdom

**Applicable Standard Specification:** BS EN 13166:2015 –Thermal insulation products for buildings – Factory made Phenolic foam (PF) products - Specification

**Applicable Specific Rules:** RD-DP21-2186 (IC) “Specific Rules for Certification of Factory Made Phenolic Foam Products - BS EN 13166:2015) Through Factory Assessment”.

S/N	Product Description	Brand Name	Product Details
1	Factory made Phenolic Foam (PF) Products  (CFC Free)*	<b>KINGSPAN KOOLTHERM</b>	Phenolic Foam Thermal Insulation Foam Thickness (Tolerance) : < 50 mm (+/-2 mm) 50 to 100 mm (-2mm, +3mm) > 100 mm (-2mm, +5 mm) Width (Tolerance): +/- 3 mm ; Length (Tolerance): +/-7.5 mm Density : 35 kg/m <sup>3</sup> (min) Thermal conductivity (Initial) – 0.029 W/(m*K), (max) (Aged) - 0.030 W/(m*K) (max) Compressive Strength: 100 kPa (min) Dimensional Stability : Length & Width – 1.5% (max) Thickness – 1.5% (max)  Code: PF-EN 13166-T1-DS(70, 90)- DS (-20,-) - CS(10)100  Manufactured with either glass tissue, composite foil or plaster board facing materials intended for walls, roof, floor, pipe and ducting insulation
		<b>KINGSPAN KOOLDUCT</b>	Phenolic Foam Thermal Insulation Foam Thickness (Tolerance) : < 50 mm (+/-2 mm) 50 to 100 mm (-2mm, +3mm) > 100 mm (-2mm, +5 mm) Width (Tolerance): +/- 3 mm ; Length (Tolerance): +/-7.5 mm Density : 55 kg/m <sup>3</sup> (min) Thermal conductivity (Initial) – 0.029 W/(m*K), (max) (Aged) - 0.030 W/(m*K) (max) Compressive Strength: 200 kPa (min) Dimensional Stability : Length & Width – 1.5% (max) Thickness – 1.5% (max)  Code: PF-EN 13166-T1-DS(70, 90)- DS (-20,-) - CS(10)200  Manufactured with composite foil facing materials intended for ducting insulation system

**DUBAI CENTRAL LABORATORY DEPARTMENT  
DCL PRODUCT CONFORMITY CERTIFICATION SCHEME**

**SCOPE OF CERTIFICATION  
FOR CERTIFICATE NO. CL16020337**

NOTE 1: Maximum k-value measured at 35 °C temperature and 60% relative humidity condition

NOTE 2: This certification covers the Phenolic Foam (PF) insulation only

NOTE 3: This document forms part of the Certificate of Product Conformity bearing the same certificate number

NOTE 4: Reaction to fire meets Euro Class E Fire classification

NOTE 5: \*In compliance with clause 701.01 (1) of the Green Building Regulations and Specifications

NOTE 6: The above products shall bear the DCL Conformity Mark applied on each individual product.

Original Issue Date : 03 March 2016  
Current Issue Date : 03 March 2016  
Valid Until : 02 March 2017

ARIF HUSAIN AL MARZOOQI  
Head, Products Conformity Assessment Section  
Dubai Central Laboratory Department



# Certificate of Compliance

Certificate Number 20150130-MH25124  
Report Reference MH25124-20061003  
Issue Date 2015-January-30

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*Issued to:* KINGSPAN INSULATION LTD  
PEMBRIDGE  
LEOMINSTER  
HEREFORDSHIRE  
HR6 9LA UNITED KINGDOM

*This is to certify that representative samples of* **AIR DUCTS**


Identified as Kingspan KoolDuct®. The product is made in nominal 20 mm through 33 mm thicknesses.

*Have been investigated by Underwriters Laboratories in accordance with the Standard(s) indicated on this Certificate.*

*Standard(s) for Safety:* Factory Made Air Ducts and Air Connectors, UL 181

*Additional Information:* See UL On-line Certification Directory at [WWW.UL.COM](http://WWW.UL.COM) for additional information.

**Only those products bearing the UL Listing Mark should be considered as being covered by UL's Listing and Follow-Up Service.**

The UL Listing Mark generally includes the following elements: the symbol UL in a circle:  with the word "LISTED"; a control number (may be alphanumeric) assigned by UL; and the product category name (product identifier) as indicated in the appropriate UL Directory.

**Look for the UL Listing Mark on the product**

**William R. Carney**  
**Director, North American Certification Programs**

Underwriters Laboratories Inc.

Any information and documentation involving UL Mark services are provided on behalf of Underwriters Laboratories Inc. (UL) or any authorized licensee of UL.

For questions, please contact a local UL Customer Service Representative at <http://www.ul.com/global/eng/pages/corporate/contactus>



File MR25124  
Project 10CA42463

December 13, 2011

REPORT

on

[Air Ducts and Air Connectors] Air Ducts

Kingspan Insulations Ltd  
Herefordshire, United Kingdom Hr6 9LA

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DESCRIPTION

PRODUCT COVERED:

The product covered by this Report is a Class 1 rigid air duct. The product is designated Koolduct NT.

INTENDED USE:

The air duct is intended to be used in air conditioning and warm air heating systems in accordance with the Standards of the National Fire Protection Association for the Installation of Air Conditioning and Ventilating Systems, NFPA No. 90A and/or the Standard of the National Fire Protection Association for the Warm Air Heating and Air Conditioning Systems, NFPA No. 90B.

The air duct covered by this Report is intended for use as a building material as authorized by the authorities having jurisdiction.

CONSTRUCTION MATERIALS:

A detailed description of the specific construction, the composition and the specifications of the materials used are on file at Underwriters Laboratories Inc.

MARKING:

Each piece of the air duct is marked with the following.

1. Manufacturer's name.
2. Maximum recommended air velocity.
3. Maximum rated negative and positive pressure.
4. Maximum hanger spacing.
5. Maximum supply duct dimension without reinforcement.
6. Minimum return duct dimension without reinforcement.
7. Class rating.

## TEST RECORD NO. 1

## SAMPLES:

Samples of Koolduct NT were submitted by the manufacturer for examination and test.

## GENERAL:

Test results relate only to the items tested. The following tests were conducted in accordance with the Tenth Edition of UL 181, Factory Made Air Ducts and Air Connectors.

Tests	Standard	Project
Flame Penetration	UL 181, Tenth Edition	08NK17554
Mold Growth and Humidity	UL 181, Tenth Edition	08NK17554 and 10CA42463
Temperature (high and low)	UL 181, Tenth Edition	10CA42463
Puncture	UL 181, Tenth Edition	10CA42463
Static Load	UL 181, Tenth Edition	08NK17554
Impact	UL 181, Tenth Edition	08NK17554
Erosion	UL 181, Tenth Edition	08NK17554
Pressure	UL 181, Tenth Edition	08NK17554
Collapse	UL 181, Tenth Edition	08NK17554 and 10CA42463
Surface Burning	UL 181, Tenth Edition	10CA42463
Burning	UL 181, Tenth Edition	08NK17554

The following tests were also conducted:

Cone Calorimeter - Foam Core	Project 08NK17554
High Temperature and Humidity - Finished Duct	Project 10CA42463
Qualitative Infrared Analysis - Caulk	Project 10CA42463
Thermogravimetric Analysis - Caulk	Project 10CA42463

The materials used in this investigation were produced under the observation of a representative of Underwriters Laboratories Inc., in a ready-to-use form. The composition of the finished materials is of a proprietary nature. Data on the composition is on file at the Laboratories for use in the Follow-Up Service Program.

Test Record Summary:

The results of this investigation, including construction review and testing, indicate that the product evaluated complies with the applicable requirements in the Tenth Edition of UL 181, Factory Made Air Ducts and Air Connectors and therefore, such product is judged eligible to bear UL's Mark as described on the Conclusion Page of this Report.

Reviewed by,

Janet Burton (Ext. 43335)  
Fire Protection

James Hatcher (Ext. 42688)  
Fire Protection



## CONCLUSION

Samples of the product covered by this Report have been found to comply with the requirements covering the category and the product is found to comply with UL's applicable requirements. The description and test result in this Report are only applicable to the sample(s) investigated by UL and does not signify UL certification or that the product(s) described are covered under UL's Follow-Up Service Program. When covered under UL's Follow-Up Service Program, the manufacturer is authorized to use the UL Listing Mark on such products which comply with UL's Follow-Up Service Procedure and any other application requirements of Underwriters Laboratories Inc. The Listing Mark of Underwriters Laboratories Inc. on the product, or the UL symbol on the product and the Listing Mark on the smallest unit container in which the product is packaged, is the only method to identify products investigated by UL to published requirements and manufactured under UL's Listing and Follow-Up Service.

This Report is intended solely for the use of UL and the Applicant for establishment of UL certification coverage of the product under UL's Follow-Up Service. UL retains all rights, title and interest (including exclusive ownership) in this Report and all copyright therein. Unless expressly authorized in writing by UL, the Applicant shall not disclose or otherwise distribute this Report or its contents to any third party or use this Report for any purpose other than to establish UL certification and become eligible for Follow-Up Service for the product(s) described in this Report. Any other use of this Report including without limitation, evaluation or certification by a party other than UL unless part of a certification scheme, is prohibited and renders the Report null and void. UL shall not incur any obligation or liability for any loss, expense, or punitive damages, arising out of or in connection with the use or reliance upon the contents of this Report to anyone other than the Applicant as provided in the agreement between UL and Applicant. Any use or reference to UL's name or certification mark(s) by anyone other than the Applicant in accordance with the agreement is prohibited without the express written approval of UL or any authorized licensee of UL. Any information and documentation involving UL Mark services are provided on behalf of Underwriters Laboratories Inc. (UL) or any authorized licensee of UL. UL shall not otherwise be responsible to anyone for the use of or reliance upon the contents of this Report.

Report by:

Reviewed by:

Janet Burton  
Engineering Assoc

James Hatcher  
Staff Engineer

# test report

**Bodycote**

**BS 476: Part 6: 1989**

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

**WF Report Number**

**178078**

**Date:**

**9<sup>th</sup> January 2009**

**Test Sponsor:**

**Kingspan Insulation Limited**



**Bodycote warringtonfire Test Report No. 178078**

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

**Sponsored By**

**Kingspan Insulation Limited  
Pembridge  
Leominster  
Herefordshire  
HR6 9LA**

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## Test Details

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<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".
<b>Scope of test</b>	<p>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.</p> <p>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.</p>
<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 28 <sup>th</sup> November 2008 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>	<p>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 3<sup>rd</sup> November 2008.</p> <p>Prior to the tests, all of the specimens were conditioned to constant mass at a temperature of <math>23 \pm 2^{\circ}\text{C}</math> and a relative humidity of <math>50 \pm 5\%</math>. One specimen from the total sample submitted for test was selected for constant mass verification</p>
<b>Form in which the specimens were tested</b>	Material
<b>Exposed face</b>	One of two identical faces of the specimens was exposed to the heating conditions of the test.

## 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.

General description	A rigid thermoset phenolic insulation core material
Trade name / product reference	"Kooltherm/KoolDuct Products"
Name of manufacturer	Kingspan Insulation Limited
Weight per unit area	1.32kg/m <sup>2</sup> (stated by sponsor) 1.07kg/m <sup>2</sup> (determined by <b>Bodycote warringtonfire</b> )
Density	49.96kg/m <sup>3</sup> (determined by <b>Bodycote warringtonfire</b> )
Thickness	22mm (stated by sponsor) 21.42mm (determined by <b>Bodycote warringtonfire</b> )
Colour	"Pink"
Flame retardant details	<b>The sponsor of the test has confirmed that no flame retardant additives were utilised in the production of the product / component</b>
Brief description of manufacturing process	Continuous lamination



## 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 = 11.3**

**Sub index,  $i_1$  = 5.9**

**Sub index,  $i_2$  = 3.9**

**Sub index,  $i_3$  = 1.5**

**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.

### 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**.

<i>Report Issued: 9<sup>th</sup> January 2009</i>
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Table 1

**Laboratory Record Sheet**

**FIRE PROPAGATION TEST - BS 476 : PART 6 : 1989**

**Specimen No. : 1**

**Date : 28-Nov-08**

Time mins t	Specimen Temperature Deg C Ts	Calibration Temperature Deg C Tc	Ts- Tc/10t	Sub Index Of Performance
0.50	20	11	1.80	5.72
1.00	30	16	1.40	
1.50	36	23	0.87	
2.00	42	28	0.70	
2.50	46	33	0.52	
3.00	52	39	0.43	
4.00	88	68	0.50	3.44
5.00	139	106	0.66	
6.00	169	143	0.43	
7.00	195	159	0.51	
8.00	211	170	0.51	
9.00	227	186	0.46	
10.00	238	202	0.36	
12.00	253	216	0.31	1.29
14.00	266	224	0.30	
16.00	272	236	0.23	
18.00	281	242	0.22	
20.00	292	245	0.24	
<b>Total Index of Performance S</b>			<b>=</b>	

**SubIndex s1                      5.72**

**SubIndex s2                      3.44**

**SubIndex s3                      1.29**

**Index of Performance S      10.44**

Table 2

**Laboratory Record Sheet**

**FIRE PROPAGATION TEST - BS 476 : PART 6 : 1989**

**Specimen No. : 2**

**Date : 28-Nov-08**

Time mins t	Specimen Temperature Deg C Ts	Calibration Temperature Deg C Tc	Ts- Tc/10t	Sub Index Of Performance
0.50	22	13	1.80	
1.00	29	20	0.90	
1.50	36	27	0.60	
2.00	42	31	0.55	
2.50	46	35	0.44	
3.00	51	38	0.43	4.72
4.00	89	64	0.63	
5.00	135	108	0.54	
6.00	164	137	0.45	
7.00	184	159	0.36	
8.00	204	174	0.38	
9.00	220	188	0.36	
10.00	229	201	0.28	2.98
12.00	246	219	0.23	
14.00	262	226	0.26	
16.00	274	233	0.26	
18.00	290	242	0.27	
20.00	296	249	0.24	1.24
<b>Total Index of Performance S</b>			<b>=</b>	<b>8.95</b>

**SubIndex s1                      4.72**

**SubIndex s2                      2.98**

**SubIndex s3                      1.24**

**Index of Performance S        8.95**

Table 3

**Laboratory Record Sheet**

**FIRE PROPAGATION TEST - BS 476 : PART 6 : 1989**

**Specimen No. : 3**

**Date : 28-Nov-08**

Time mins t	Specimen Temperature Deg C Ts	Calibration Temperature Deg C Tc	Ts- Tc/10t	Sub Index Of Performance
0.50	26	12	2.80	
1.00	34	19	1.50	
1.50	39	24	1.00	
2.00	45	30	0.75	
2.50	49	33	0.64	
3.00	55	37	0.60	7.29
4.00	96	65	0.78	
5.00	149	106	0.86	
6.00	180	125	0.92	
7.00	207	145	0.89	
8.00	226	167	0.74	
9.00	241	187	0.60	
10.00	251	201	0.50	5.27
12.00	273	216	0.48	
14.00	287	222	0.46	
16.00	298	231	0.42	
18.00	306	242	0.36	
20.00	318	249	0.35	2.06
<b>Total Index of Performance S</b>			<b>=</b>	<b>14.62</b>

**SubIndex s1                      7.29**

**SubIndex s2                      5.27**

**SubIndex s3                      2.06**

**Index of Performance S      14.62**

## Appendix 1

### Effect of thermal characteristics on the performance of specimens

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 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:

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.



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BS 476: Part 7: 1997

Method For Classification Of  
The Surface Spread Of Flame  
Of Products

WF Report Number

178081

Date:

9<sup>th</sup> January 2009

Test Sponsor:

Kingspan Insulation Limited



**Bodycote warringtonfire Report No. 178081**

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

**Sponsored By**

**Kingspan Insulation Limited  
Pembridge  
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Herefordshire  
HR6 9LA**

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## Test Details

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<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 7: 1997, "Fire tests on building materials and structures, method for classification of the surface spread of flame of products". This test was therefore 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.
<b>Scope of test</b>	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.
<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 have 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 2 <sup>nd</sup> December 2008 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>	<p>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 3<sup>rd</sup> November 2008.</p> <p>Prior to the tests, all of the specimens were conditioned to constant mass at a temperature of <math>23 \pm 2^{\circ}\text{C}</math> and a relative humidity of <math>50 \pm 5\%</math>. One specimen from the total sample submitted for test was selected for constant mass verification</p>
<b>Form in which the specimens were tested</b>	Material
<b>Exposed face</b>	One of two identical faces of the specimens was exposed to the heating conditions of the test.



## 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.

General description	A rigid thermoset phenolic insulation core material
Trade name / product reference	"Kooltherm/KoolDuct Products"
Name of manufacturer	Kingspan Insulation Limited
Weight per unit area	1.32kg/m <sup>2</sup> (stated by sponsor) 1.07kg/m <sup>2</sup> (determined by <b>Bodycote warringtonfire</b> )
Density	49.96kg/m <sup>3</sup> (determined by <b>Bodycote warringtonfire</b> )
Thickness	22mm (stated by sponsor) 21.42mm (determined by <b>Bodycote warringtonfire</b> )
Colour	"Pink"
Flame retardant details	<b>The sponsor of the test has confirmed that no flame retardant additives were utilised in the production of the product / component</b>
Brief description of manufacturing process	Continuous lamination

## Test Results

---

### Results and observations

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.

### Classification

**In accordance with the class definitions given in BS 476: Part 7: 1997, the specimens tested are classified as class 1.**

### Criteria for classification

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.

### Applicability of test result

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 2 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**.

<i>Report Issued: 9<sup>th</sup> January 2009</i>
---

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## 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 (mm)	75	225	375	525	675	825
Irradiance at points specified above (kW/m <sup>2</sup> )	32.5	21.0	14.5	10.0	7.0	5.0

Note: A tolerance of  $\pm 0.5$  kW/m<sup>2</sup> is specified on the irradiance measurement

### Classification of spread of flame

Classification	Spread of Flame at 1.5 min		Final Spread of Flame	
	Limit (mm)	Limit for one specimen (mm)	Limit (mm)	Limit for one specimen (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: 1997 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  $(25 \pm 1)$  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.



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**IMO 2010 FTP Code  
Part 5 - Test For Surface  
Flammability (Test For  
Surface Materials And  
Primary Deck Coverings)  
MSC.307(88) test on  
Kingspan Koolduct**

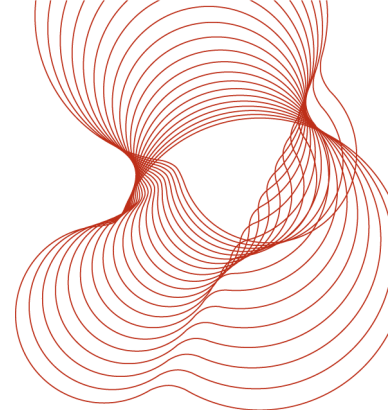
Prepared for:  
Kingspan Insulation Limited  
Pembroke  
Leominster  
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HR6 9LA

13<sup>th</sup> December 2013

Test report number 291562



0578



**Prepared on behalf of BRE Global by**

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Date 13/12/13

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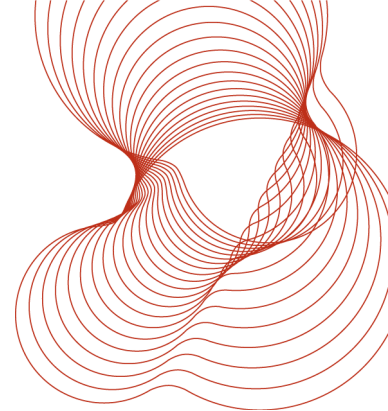
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## 1 Objective

To measure and classify the sample described in Section 2 to the fire characteristics of bulkhead, ceiling and deck finish materials as a basis for characterizing their flammability and thus their suitability for use in the marine construction using the procedure stated in IMO 2010 FTP Code. Part 5 - Test For Surface Flammability (Test For Surface Materials And Primary Deck Coverings). MSC.307(88)<sup>1</sup>.

## 2 Sample

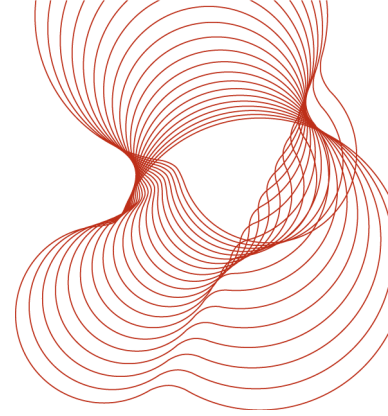
### 2.1 Traceability

The test samples were supplied by the test sponsor. BRE Global were not involved in the sample selection process and therefore cannot comment upon the relationship between the samples supplied for test and the product supplied to market.

### 2.2 Description of sample and test format.

Unless otherwise stated all measurements are nominal.

Test Sponsor	Kingspan Insulation Limited Pembroke Leominster Herefordshire HR6 9LA
Manufacturer of sample	As above
Sample name/reference	Kingspan Koolduct
Sample description (as provided by test sponsor/manufacturer)	Phenolic foam faced with an auto-adhesively bonded foil facing. No further details of the sample have been given.
Description of sample (as received)	Rigid foam with a reinforced foil facing, printed on one face
Mean weight per unit area (kg/m <sup>2</sup> )	1.58
Mean thickness (mm)	21
Sample receipt date	19 <sup>th</sup> November 2013
Test face	Non printed face
Date of test	6 <sup>th</sup> December 2013



### 3 Conditioning

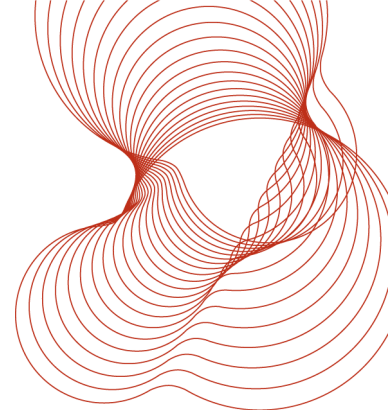
The specimens were conditioned as required by the standard.

### 4 Results

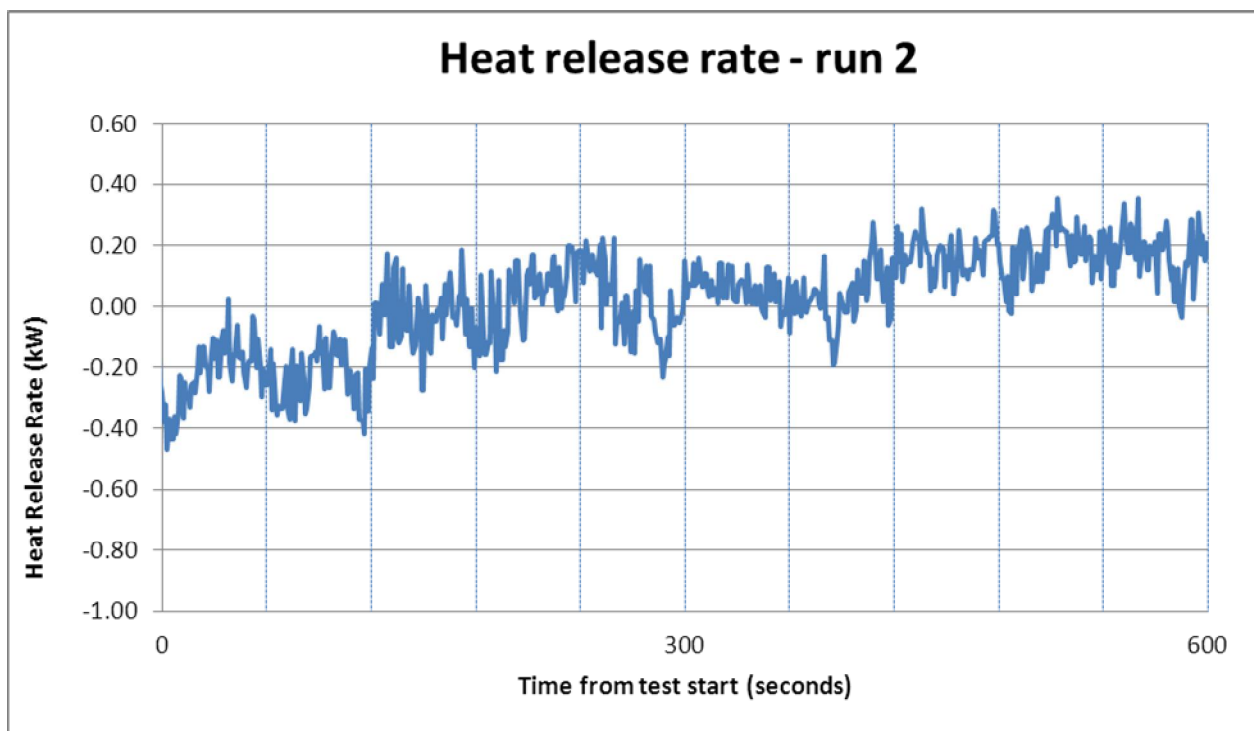
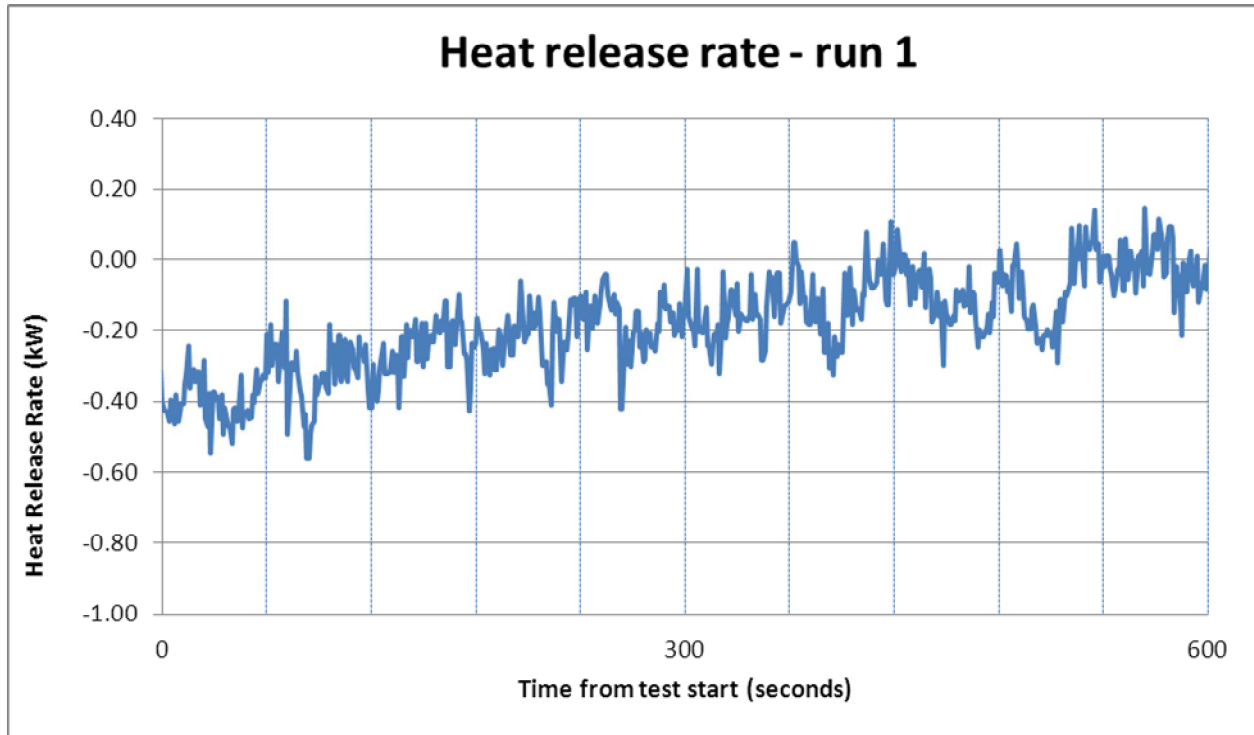
4.1 Table 1 shows the observed ignition time, extinction time, duration of test, final spread of flame for each specimen and time to reach each reference point

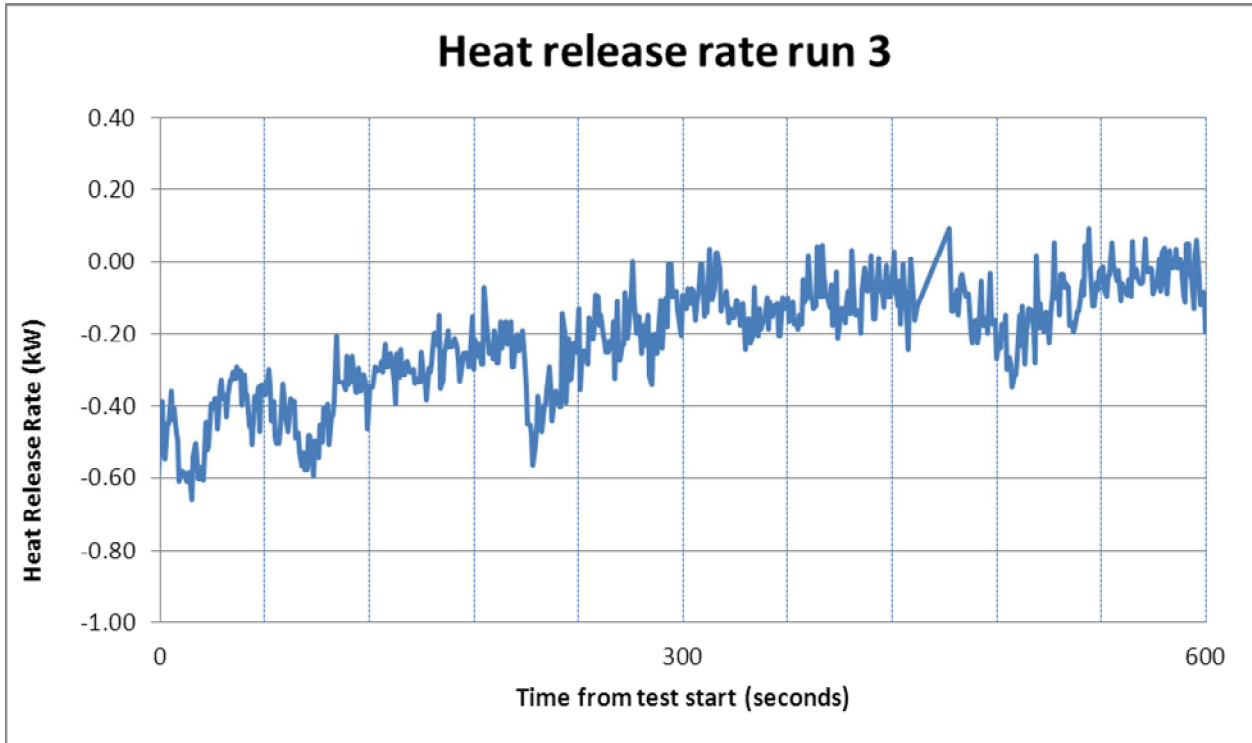
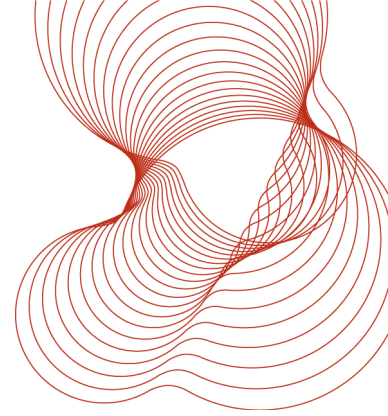
**Table 1**

Flame spread distance (mm)	Flame spread times:					
	Test 1		Test 2		Test 3	
	minutes	seconds	minutes	seconds	minutes	seconds
50						
100						
150						
200						
250						
Maximum flame spread (mm)	0		0		0	
Time to ignition (minutes : seconds)						
Flaming ceased (minutes : seconds)						
Test stopped (minutes : seconds)	10	00	10	00	10	00



#### 4.2 Heat release curves for each specimen





4.3 Table 2 shows the derived fire characteristics for each specimen as defined in the objective.

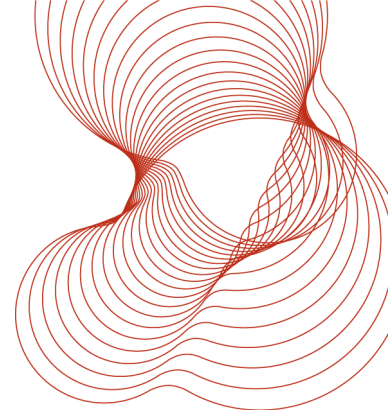
**Table 2**

Criteria	Specimen			
	1	2	3	Average
Heat for Ignition (MJ/m <sup>2</sup> )	n/a	n/a	n/a	n/a
Critical Flux at Extinguishment ((kW/m <sup>2</sup> ) <i>CFE</i>	46.70	46.70	46.70	46.70
Average Heat for sustained burning (MJ/m <sup>2</sup> ) <i>Qsb</i>	not defined	not defined	not defined	see NOTE
Total Heat release (MJ) <i>Qt</i>	0.00	0.03	0.00	0.01
Peak Heat release (kW) <i>Qp</i>	0.24	0.51	0.19	0.31

**NOTE:** If the heat of sustained burning is not defined for all three specimens, *Qsb* is undefined and the criterion of *Qsb* is deemed to have been met.

4.4 Observations

.There was no ignition on any of the specimens.



## 5 Criteria

Samples giving average values for all the surface flammability criteria not exceeding those listed in table 4, are considered to meet the requirements for low flame spread.

**Table 4**

	Bulkhead, wall and ceiling linings	Floor coverings	Primary deck coverings
<i>CFE</i> (kW/m <sup>2</sup> )	≥ 20.0	≥ 7.0	≥ 7.0
<i>Qsb</i> (MJ/m <sup>2</sup> )	≥ 1.5	≥ 0.25	≥ 0.25
<i>Qt</i> (MJ)	≤ 0.7	≤ 2.0	≤ 2.0
<i>Qp</i> (kW)	≤ 4.0	≤ 10.0	≤ 10.0
Burning droplets	Not produced	No more than 10 burning drops	Not produced

Where

<i>CFE</i>	=	Critical flux at extinguishment
<i>Qsb</i>	=	Average heat for sustained burning
<i>Qt</i>	=	Total heat release
<i>Qp</i>	=	Peak heat release rate

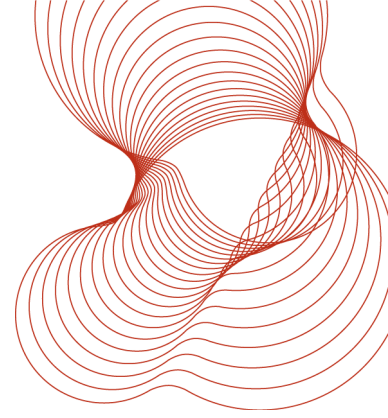
## 6 Conclusion

The results of this test show that the sample as described in this report, when tested and classified in accordance with IMO 2010 FTP Code, Part 5 - Test For Surface Flammability (Test For Surface Materials And Primary Deck Coverings). MSC.307(88)<sup>1</sup> satisfied the requirements for low flame spread for use as:

Bulkhead, wall and ceiling linings

Floor coverings

Primary deck coverings



## 7 Validity

The test results relate only to behaviour of the test specimens of the product under the particular conditions of test, they are not intended to be the sole criteria for assessing the potential fire hazard of the product in use.

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 5 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.

## 8 Reference

- 1 Resolution MSC.307(88) Adoption of the International Code for application of fire test procedures 2010, Annex 1, Part 5 Test for surface flammability Test for surface materials and primary deck coverings. International Maritime Organisation: London 2010.

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=====REPORT ENDS=====



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**2010 FTP Code Part 2 -  
Smoke and Toxicity Test  
on Kingspan Koolduct**

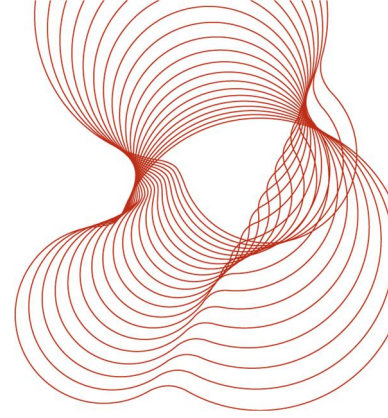
Prepared for:

Kingspan Insulation Limited  
Pembroke  
Leominster  
Herefordshire  
HR6 9LA

15<sup>th</sup> January 2014  
Test report number 291051  
Revision 1



0578



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Date 15/01/14

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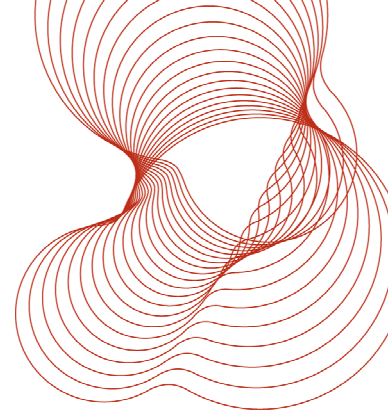
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## 1 Objective

The test was conducted in accordance with the procedure specified in 2010 FTP Code, Part 2 – Smoke and Toxicity Test <sup>(1)</sup>. This report should be read in conjunction with this test standard.

## 2 Sample Description

Test Sponsor	Kingspan Insulation Limited, Pembridge, Leominster, Herefordshire, HR6 9LA
Manufacturer of sample	As Above
Sample name/reference	Kingspan Koolduct
Type of material (for classification purposes)	Unknown
Sample description (as provided by test sponsor/manufacturer)	Phenolic foam faced with an auto-adhesively bonded foil facing. No further details of the sample have been given.
Description of sample (as received)	Rigid foam with a reinforced foil facing, printed on one face
Sample face tested	Not Specified
Sample dimensions (mm)	75x75
Sample weight per surface area (kg/m <sup>2</sup> ) (measured)	1.56
Sample thickness (mm) (measured)	21.5
Sample receipt date	18/11/13
Date of test	10/12/13

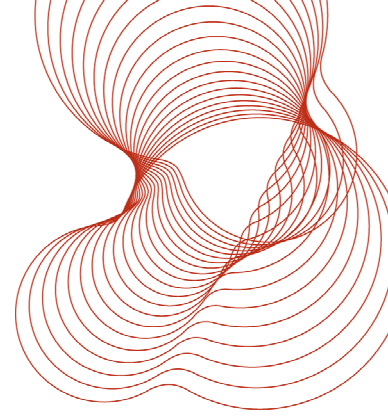
The test samples were supplied by the client. BRE were not involved in the sample selection process and therefore cannot comment upon the relationship between samples supplied for test and the product supplied to market.

Unless otherwise stated all measurements are nominal.

## 3 Conditioning

The specimens were conditioned as required by the Standard.

## 4 Test conditions



Three specimens of material were tested in accordance with the following schedule:

Mode 1: Irradiance 25 kW/m<sup>2</sup>, no pilot flame

Mode 2: Irradiance 25 kW/m<sup>2</sup>, with pilot flame

Mode 3: Irradiance 50 kW/m<sup>2</sup>, no pilot flame

## 5 Test results

**Table 1 Summary of smoke test results**

Test condition	Specimen 1 Ds (max)	Specimen 2 Ds (max)	Specimen 3 Ds (max)	Average specific Optical Density
25kW/m <sup>2</sup> no pilot flame	5.73	4.02	1.08	3.61
25kW/m <sup>2</sup> with pilot flame	2.92	3.99	2.64	3.18
50kW/m <sup>2</sup> no pilot flame	53.29	22.91	14.45	30.22

### **FTIR Test Parameters**

#### **Data regarding test apparatus**

Sampling Response Period (SRP) = 20 sec

Inner volume of gas cell = 0.375L

Inner volume and length of gas sampling line = 0.00001884m<sup>3</sup> and 1.5m

The capacity of the gas sampling pump = 1.5L/min

#### **In Tables 2, 3 and 4 below**

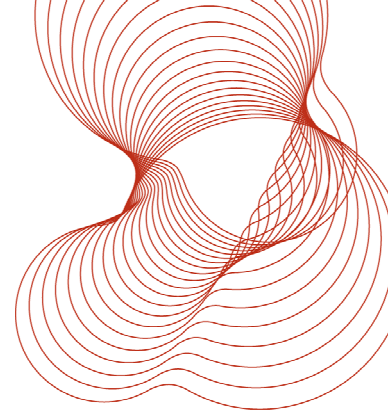
C = maximum gas concentration (ppm) (concentration of each Gas measured by FTIR for each test run)

Cca = gas concentration correction, if applicable (ppm) (concentration of acid gases absorbed by filters, determined by IC)

C+Cca = corrected maximum gas concentration (ppm) (maximum gas concentration plus acid gas corrections)

**Table 2 Summary of toxicity results - irradiance 25 kW/m<sup>2</sup>, no pilot flame**

Maximum smoke density sampling time (DmST) = 1180 sec



Gas	C (ppm)		Cca (ppm)		C+Cca (ppm)		Average (ppm)
	Run 2	Run 3	Run 2	Run 3	Run 2	Run 3	
Hydrogen chloride	14.81	10.83	0.12	0.10	14.93	10.93	12.9
Hydrogen bromide	1.77	0.66	0.0	0.0	1.77	0.66	1.2
Hydrogen fluoride	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sulphur dioxide	8.80	0.81	0.0	0.0	8.80	0.81	4.8
Hydrogen cyanide	4.56	2.26	n/a	n/a	4.56	2.26	3.4
Nitrogen oxides	6.74	3.11	n/a	n/a	6.74	3.11	4.9
Carbon monoxide	12.01	6.25	n/a	n/a	12.01	6.25	9.1

**Table 3 Summary of toxicity results - irradiance 25 kW/m<sup>2</sup>, with pilot flame**

Maximum smoke density sampling time (DmST) = 1180 sec

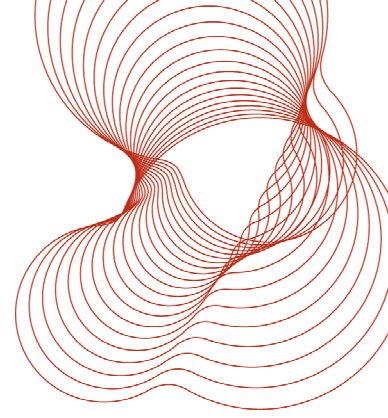
Gas	C (ppm)		Cca (ppm)		C+Cca (ppm)		Average (ppm)
	Run 2	Run 3	Run 2	Run 3	Run 2	Run 3	
Hydrogen chloride	16.64	16.69	0.07	0.08	16.71	16.77	16.7
Hydrogen bromide	0.67	0.66	0.0	0.0	0.67	0.66	0.7
Hydrogen fluoride	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sulphur dioxide	38.59	30.33	0.0	0.0	38.59	30.33	34.5
Hydrogen cyanide	12.50	9.14	n/a	n/a	12.50	9.14	10.8
Nitrogen oxides	4.40	6.43	n/a	n/a	4.40	6.43	5.4
Carbon monoxide	27.37	24.41	n/a	n/a	27.37	24.41	25.9

**Table 4 Summary of toxicity results - irradiance 50 kW/m<sup>2</sup>, no pilot flame**

Maximum smoke density sampling time (DmST) = 906, 934 sec

Gas	C (ppm)		Cca (ppm)		C+Cca (ppm)		Average (ppm)
	Run 2	Run 3	Run 2	Run 3	Run 2	Run 3	
Hydrogen chloride	33.03	27.37	0.07	0.10	33.10	27.47	30.3
Hydrogen bromide	0.88	2.13	0.0	0.0	0.88	2.13	1.5
Hydrogen fluoride	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sulphur dioxide	75.06	57.19	0.0	0.0	75.06	57.19	66.1
Hydrogen cyanide	5.26	2.78	n/a	n/a	5.26	2.78	4.0
Nitrogen oxides	28.36	20.50	n/a	n/a	28.36	20.50	24.4
Carbon monoxide	40.23	36.15	n/a	n/a	40.23	36.15	38.2

**Table 5: Observations**



Test Mode	Observation
Mode 1: Irradiance 25 kW/m <sup>2</sup> , no pilot flame	Specimens did not ignite. Smoke density rose throughout the test runs and did not reach a maximum within the 1200 second test duration. By test end specimens had charred. Toxicity samples were taken from the second and third burns at 1199 seconds.
Mode 2: Irradiance 25 kW/m <sup>2</sup> , with pilot flame	Specimens did not ignite. Maximum smoke on first specimen occurred at 660 sec, so toxicity sample on second and third specimens taken between 650 – 670 seconds. Specimens had charred.
Mode 3: Irradiance 50 kW/m <sup>2</sup> , no pilot flame	Specimens did not ignite. Maximum smoke on first specimen occurred at 596 sec, so toxicity sample on second and third specimens taken between 586 – 606 seconds. Specimens had charred

## 6 Conclusions

### 2.4 Classification criteria

#### 2.4.1 Smoke

An average ( $D_m$ ) of the maximum specific optical density of smoke ( $D_s \max$ ) of three tests at each test condition shall be calculated:

- .1 for materials used as surface of bulkheads, linings or ceilings, the  $D_m$  shall not exceed 200 in any test condition;
- .2 for materials used as primary deck coverings, the  $D_m$  shall not exceed 400 in any test condition;
- .3 for materials used as floor coverings, the  $D_m$  shall not exceed 500 in any test condition; and
- .4 for plastic pipes, the  $D_m$  shall not exceed 400 in any test condition.

The average maximum  $D_s$  for the product described in Section 2 of this report was;

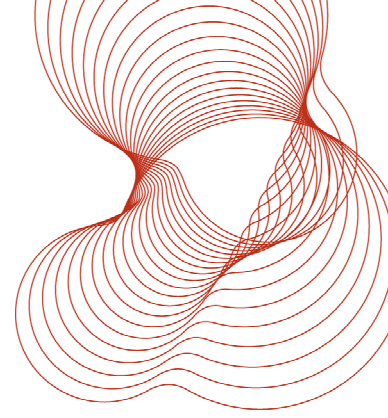
at test condition 25kW/m<sup>2</sup> without pilot flame: 3.61;

at test condition 25kW/m<sup>2</sup> with pilot flame: 3.18; and

at test condition 50kW/m<sup>2</sup> without pilot flame: 30.22.

The product therefore meets the requirements of all sub-clauses.

#### Clause 2.4 Classification criteria:



### 2.4.2 Toxicity

The average value of the maximum value of the gas concentration measured at each test condition shall not exceed the following limits:

Gas	Limit of Gas Concentration (ppm)
Carbon monoxide	1450
Hydrogen fluoride	600
Hydrogen chloride	600
Hydrogen bromide	600
Hydrogen cyanide	140
Nitrogen dioxide	350
Sulphur dioxide	120 (200 for floor coverings)

The maximum gas concentration limits are given in Table 2 along with the material's test results in each mode.

The product therefore meets the requirements of this clause.

## 7 Validity

This report is revision 1 of BRE Global report 291051 dated 8<sup>th</sup> January 2014. At the request of the client, a correction to the product name has been made in this report and an incorrect reference has been deleted. BRE Global report 291051 dated 8<sup>th</sup> January 2014 has been withdrawn with effect from the date of this report.

The test results relate only to behaviour of the test specimens of the product under the particular conditions of test, they are not intended to be the sole criteria for assessing the potential fire hazard of the product in use.

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 5 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.

## 8 Reference

1. 2010 FTP Code. Adoption of the International Code for Application of Fire Test Procedures, 2010. (*Resolution MSC.307(88)*)

=====REPORT ENDS=====