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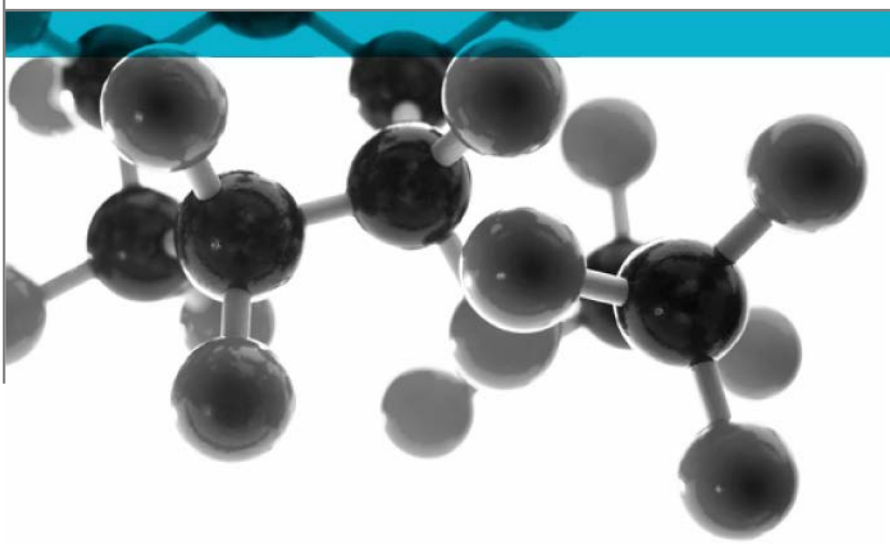
BS EN ISO 1716:2010



Determination Of The Heat Of Combustion For Building Products

A Report To: Black Mountain

Document Reference: 367112

Date: 8th June 2016

Issue No.: 1

Testing
Advising
Assuring

UKAS TESTING
0249

Executive Summary

Objective To determine the performance of the following composite when tested in accordance with BS EN ISO 1716: 2010.

Generic Description	Product reference	Thickness	Weight per unit area
Magnesium oxide board	"Magply"	3-20mm	Not stated
Individual components used to manufacture composite:			
Glass fibre mesh webbing	"Generic"	4 x 0.31mm	4 x 105g/m^2
Magnesium oxide	"Magply"	3-20mm	3.3-19kg/m^2
Please see page 5 of this test report for the full description of the product tested			

Test Sponsor Black Mountain, Bradwell Hall, Bradwell-on-Sea, Essex, CM0 7HX.

Test Results:

Component part	PCS per mass (MJ/kg)	PCS per area (MJ/m^2)
Glass fibre mesh webbing	**0.1761**	**0.0185**
Magnesium oxide	**0.0317**	**0.1047**
Total product:	**0.0480**	**0.1787**

Date of Test 15th & 17th March 2016

Signatories

Responsible Officer
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Approved
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Senior Technical Officer

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Business Unit Head

* For and on behalf of **Exova Warringtonfire**.

Report Issued: 8th June 2016

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Test Details

Purpose of test

To determine the calorific potential of a building material during combustion when it is tested in accordance with the test specified in BS EN ISO 1716:2010 "Reaction To Fire Tests For Building Products – Determination Of The Heat Of Combustion".

The test was performed in accordance with the procedure specified in BS EN ISO 1716:2010 and this test report should be read in conjunction with that European Standard.

Scope of test

BS EN ISO 1716 specifies a method of test for determining the heat of combustion of building materials at constant volume in a bomb calorimeter. Results are reported as individual values which may be interpreted by reference to other documents; e.g. EN 13501-1:2007 + A1: 2009 "Fire Classification of Construction Products and Building Elements Part 1 Classification using Test Data from Reaction to Fire Tests.

The test is intended for materials or products whether composite products or coated products.

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 15th & 17th March at the request of International Petroleum Products Ltd., a representative of the sponsor of the test.

Provision of test specimens

The specimens were supplied by the sponsor of the test. **Exova Warringtonfire** was not involved in any selection or sampling procedure.

Conditioning of specimens

The specimens were received on the 11th January & 9th March 2016. Prior to test the prepared specimens were conditioned for at least 48 hours at a temperature of 23 ± 2°C and a relative humidity of 50 ± 5%, in accordance with BS EN 13238:2010

Test procedure

The specimens were tested using an additional combustible substance of known and high calorific value which for this test was paraffin oil. The specimens were tested using the crucible/cigarette method in an isoperibol bomb calorimeter.

The water equivalent (E) of the bomb calorimeter was 0.01010.MJ/K.

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		Reinforced magnesium oxide board
Product reference of overall composite		"Magply"
Name of manufacturer of overall composite		"Black Mountain"
Thickness of overall composite		3-20mm
Density / weight per unit area of overall composite		**See Note 1 below**
Product configuration		• Webbing (inlaid slightly into board) • Webbing (inlaid slightly into board) • Board • Webbing (inlaid slightly into board) • Webbing (inlaid slightly into board)
Webbing	Generic type	Glass fibre mesh
	Product reference	"Generic"
	Name of manufacturer	**See Note 1 below**
	Colour reference	"White"
	Thickness	0.31mm
	Weight per unit area	105g/m^2
	Type of weave	Cross lapped web mesh
	Flame retardant details	**See Note 2 below**
Board	Generic type	Magnesium oxide board
	Product reference	"Magply"
	Name of manufacturer	Black Mountain
	Thickness	3-20mm
	Weight per unit area	3.3-19kg/m^2
	Density	1100 kg/m^3
	Colour reference	"White"
	Flame retardant details	**See Note 2 below**
Brief description of manufacturing process		Extruded and air cured

Note 1. The sponsor of the test was unwilling to provide this information

Note 2. The sponsor of the test has confirmed that no flame retardant additives have been utilised in the production of the component.

The specimen was heterogeneous in nature. The specimen comprised one substantial component, and 4 external non-substantial components (1 material, 4 layers)

The table below gives the thickness and the weight per unit area values of the component parts of the specimen.

Component description	Location / type	Thickness (mm)	Weight / unit area (kg/m²)
Glass fibre mesh webbing	External non-substantial	0.31	0.105
Magnesium oxide	Substantial	3-20	3.3-19

Specimen preparation

The specimens were homogeneous and were prepared by selecting portions of the material from the sample submitted for test to give a total mass of 50g. These were then ground and reduced to a fine powder prior to conditioning for test.

The non-substantial components could not be ground into a fine powder. Specimens were therefore produced by chopping the material into small pieces prior to conditioning.

Test Results

Results of test

The test results relate only to the specimens of the product in the form in which they were tested. Small differences in the composition 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 relate to the behaviour of the test specimen of a product under the particular conditions of the test; they are not intended to be the sole criterion for assessing the potential fire hazard of the material in use.

The test results are given in Table 1 of this report. Note: the results displayed in Table 1 are for the 3mm thick product which was calculated to provide the worst case result

Results on component layers already tested

The table below details the results of previous analysis of calorific value for the component part/s being evaluated in this report:

These results are used in this report to provide total product evaluation.

Copies of all test reports are held on our confidential file at **Exova Warringtonfire**.

Component part	Report No.	Average Calorific Value (MJ/kg)	Average Calorific Value (MJ/m^2)
Glass fibre mesh webbing	362835 (Issue 2)	0.1761	0.0185
Magnesium oxide	360685 (Issue 2)	0.0317	0.1047

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.

Table 1

Product / Layer Description

The product is heterogenous and fabricated as follows:

Component Part	Type	Description
1	External Non Substantial	glass fibre mesh webbing
2	External Non Substantial	glass fibre mesh webbing
3	Substantial	magnesium oxide
4	External Non Substantial	glass fibre mesh webbing
5	External Non Substantial	glass fibre mesh webbing

Component Part 1 **Glass fibre mesh webbing**

Mass of sample:- **0.1050** **kg/m²**

Results obtained:-

Test 1:-	sample weight =	0.7071	g			
	calorific value =	0.28	MJ/kg	=	**280**	**kJ/kg**
	temperature rise =	1.4562	°C			
Test 2:-	sample weight =	0.7046	g			
	calorific value =	0.0004	MJ/kg	=	**0.4**	**kJ/kg**
	temperature rise =	1.4358	°C			
Test 3:-	sample weight =	0.7114	g			
	calorific value =	0.2478	MJ/kg	=	**247.8**	**kJ/kg**
	temperature rise =	1.4815	°C			
				Average =	**176.1**	**kJ/kg**
					0.1761	**MJ/kg**

Gross Calorific Potential Per Unit Area
(Calorific value x mass per unit area)

Test 1:-	**29.400**	**kJ/m²**
Test 2:-	**0.042**	**kJ/m²**
Test 3:-	**26.019**	**kJ/m²**

Average gross calorific potential = **18.4870** **kJ/m²**
0.0185 **MJ/m²**

Component Part 2 **Glass fibre mesh webbing**

Mass of sample:- **0.1050** **kg/m²**

Results obtained:-

Test 1:-	sample weight =	0.7071	g			
	calorific value =	0.28	MJ/kg	=	**280**	**kJ/kg**
	temperature rise =	1.4562	°C			
Test 2:-	sample weight =	0.7046	g			
	calorific value =	0.0004	MJ/kg	=	**0.4**	**kJ/kg**
	temperature rise =	1.4358	°C			
Test 3:-	sample weight =	0.7114	g			
	calorific value =	0.2478	MJ/kg	=	**247.8**	**kJ/kg**
	temperature rise =	1.4815	°C			
				Average =	**176.1**	**kJ/kg**
					0.1761	**MJ/kg**

Gross Calorific Potential Per Unit Area
(Calorific value x mass per unit area)

Test 1:-	**29.400**	**kJ/m²**
Test 2:-	**0.042**	**kJ/m²**
Test 3:-	**26.019**	**kJ/m²**

Average gross calorific potential = **18.4870** **kJ/m²**
0.0185 **MJ/m²**

Component Part 3 **Magnesium oxide**

Mass of sample:- **3.3000** **kg/m²**

Results obtained:-

Test 1:-	sample weight =	0.7018	g			
	calorific value =	0	MJ/kg	=	**0**	**kJ/kg**
	temperature rise =	1.3876	°C			
Test 2:-	sample weight =	0.7033	g			
	calorific value =	0.0135	MJ/kg	=	**13.5**	**kJ/kg**
	temperature rise =	1.4056	°C			
Test 3:-	sample weight =	0.7018	g			
	calorific value =	0.0817	MJ/kg	=	**81.7**	**kJ/kg**
	temperature rise =	1.4346	°C			
				Average =	**31.7**	**kJ/kg**
					0.0317	**MJ/kg**

Gross Calorific Potential Per Unit Area
(Calorific value x mass per unit area)

Test 1:-	**0.000**	**kJ/m²**
Test 2:-	**44.550**	**kJ/m²**
Test 3:-	**269.610**	**kJ/m²**

Average gross calorific potential = **104.720** **kJ/m²**
0.1047 **MJ/m²**

Component Part 4 **Glass fibre mesh webbing**

Mass of sample:- **0.1050** **kg/m²**

Results obtained:-

Test 1:-	sample weight =	0.7071	g			
	calorific value =	0.28	MJ/kg	=	**280**	**kJ/kg**
	temperature rise =	1.4562	°C			
Test 2:-	sample weight =	0.7046	g			
	calorific value =	0.0004	MJ/kg	=	**0.4**	**kJ/kg**
	temperature rise =	1.4358	°C			
Test 3:-	sample weight =	0.7114	g			
	calorific value =	0.2478	MJ/kg	=	**247.8**	**kJ/kg**
	temperature rise =	1.4815	°C			
				Average =	**176.066667**	**kJ/kg**
					0.17606667	**MJ/kg**

Gross Calorific Potential Per Unit Area
(Calorific value x mass per unit area)

Test 1:-	**29.4**	**kJ/m²**
Test 2:-	**0.042**	**kJ/m²**
Test 3:-	**26.019**	**kJ/m²**

Average gross calorific potential = **18.4870** **kJ/m²**
0.0185 **MJ/m²**

Component Part 5 **Glass fibre mesh webbing**

Mass of sample:- **0.1050** **kg/m²**

Test 1:-	sample weight =	0.7071	g			
	calorific value =	0.28	MJ/kg	=	**280**	**kJ/kg**
	temperature rise =	1.4562	°C			
Test 2:-	sample weight =	0.7046	g			
	calorific value =	0.0004	MJ/kg	=	**0.4**	**kJ/kg**
	temperature rise =	1.4358	°C			
Test 3:-	sample weight =	0.7114	g			
	calorific value =	0.2478	MJ/kg	=	**247.8**	**kJ/kg**
	temperature rise =	1.4815	°C			
				Average =	**176.066667**	**kJ/kg**
					0.1761	**MJ/kg**

Gross Calorific Potential Per Unit Area

(Calorific value x mass per unit area)

Test 1:-	**29.400**	**kJ/m²**
Test 2:-	**0.042**	**kJ/m²**
Test 3:-	**26.019**	**kJ/m²**

Average gross calorific potential = **18.487** **kJ/m²**

0.0185 **MJ/m²**

Calculation of Total Calorific Potential (MJ/kg) for the Product

Mass per 1m² of Component 1	0.1050	kg
Mass per 1m² of Component 2	0.1050	kg
Mass per 1m² of Component 3	3.3000	kg
Mass per 1m² of Component 4	0.1050	kg
Mass per 1m² of Component 5	0.1050	kg
Total Mass per 1m² of Product	**3.7200**	**kg**

Percentage Mass of Constituent Parts

% Component 1	2.8226	%
% Component 2	2.8226	%
% Component 3	88.7097	%
% Component 4	2.8226	%
% Component 5	2.8226	%
Average Calorific Potential Component 1	0.1761	MJ/kg
Average Calorific Potential Component 2	0.1761	MJ/kg
Average Calorific Potential Component 3	0.0317	MJ/kg
Average Calorific Potential Component 4	0.1761	MJ/kg
Average Calorific Potential Component 5	0.1761	MJ/kg

Contribution of Each Component to Total Calorific Potential

Component 1	0.0050	MJ/kg
Component 2	0.0050	MJ/kg
Component 3	0.0282	MJ/kg
Component 4	0.0050	MJ/kg
Component 5	0.0050	MJ/kg
Total Calorific Potential for the Total Product	**0.0480**	**MJ/kg**

Summary of Results

Component Part	PCS per Mass (MJ/kg)	PCS per Area (MJ/m²)
1 Webbing	0.1761	0.0185
2 Webbing	0.1761	0.0185
3 Magnesium oxide	0.0317	0.1047
4 Webbing	0.1761	0.0185
5 Webbing	0.1761	0.0185
Total Product	0.0480	0.1787

Revision History

Issue No :	Re-issue Date:
Revised By:	Approved By:
Reason for Revision:	