

Bellaterra: 10th July, 2018

File number: **18/16667-1120 Part 1**

Petitioner's reference: **SAYAHFAR&KHANDADASH FZC COMPANY**
Flexi Office, RAKEZ Bussines
POX 327078, Zone-FZ RAS AL KHAIMAH
United Arab Emirates



TEST REPORT

Date at which samples were received: 29-05-2018

1.- OBJECT OF THE TEST

Fire tests of construction products in compliance with the following standards:

- UNE-EN-ISO 1716:2011: "Reaction to fire tests for products - Determination of the gross heat of combustion".

-UNE-EN 13823:2012+A1:2016: "Reaction to fire tests for building products - Building products excluding floorings exposed to the thermal attack by a single burning item".

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2. – PRODUCT CHARACTERISTICS

The description of the specimen given below has been prepared from information provided by the sponsor:

Product Description	Aluminium Foil Sandwiching and Aluminium Hexagonal Structure		
Product Reference	Premium Bond Honeycomb Panel		
Fire side	Coated Side		
Total thickness	15 mm (stated and measured)		
Total Area Density	3.6 kg/m ² (stated)		
Product details	1 st Layer Coating (Fire Side)	Material	Polyvinylidene fluoride (PVDF) Coating
		Application method	Spray and oven baked
		Number of coats	2
		Area Density	0.05 kg/m ²
	2 nd Layer Coating	Material	Aluminium
		Thickness	0.5 mm
		Area Density	1.3 kg/m ²
	3 rd Layer Coating	Material	Adhesive film
		Thickness	0.250 mm
		Area Density	90 g/m ²
	4 th Layer Coating	Material	Hexagonal aluminium
		Thickness	14 mm
		Area Density	1 kg/m ²
	5 th Layer Coating	Material	Adhesive film
Thickness		0.250 mm	
Area Density		90 g/m ²	
6 th Layer Coating	Material	Aluminium	
	Thickness	0.5 mm	
	Area Density	1.3 kg/m ²	
7 th Layer Coating	Material	Paint	
	Area Density	0.018 kg/m ²	

Fixing system: The sample was fixed to the standard substrate (Calcium silicate according to UNE-EN 13238:2011) with screws.

Manufacturer: PREMIUM BOND. Address: Sanat sq, Shiraz Special Economic Zone, Shiraz, Iran.

3. – SPECIFICATIONS ABOUT MAINTENANCE

Not applied.

4. – DESCRIPTION OF THE FINAL USE CONDITIONS

Façade, decorative wall.

PVDF Coating (M₃)

Preparation of the Samples

Starting from a minimum mass of 10 g, it was obtained, through the grating and sieving method, enough fine powder for performing a minimum of 3 determinations. The quantity of the product used in every determination was of 0.5 g of product

Method

Determinations were performed according to the crucible method described in section 7.9 of the test standard.

Equivalent Energy Value (MJ/kg) = 2402.3040

Samples	1	2	3	Average
Higher Heating Value (in MJ/kg)	19.40	19.49	19.41	19.43
Higher Heating Value (in MJ/m²)	0.97	0.97	0.97	0.97

Criteria for acceptance or rejection (according to section 11 of the test standard):
Max - Min of the 3 reproduced tests must be ≤ **0.1 MJ/m²**

Uncertainty associated with the measure: ± 0.15 MJ/kg

Paint (Back face) (M₄)

Preparation of the Samples

Starting from a minimum mass of 10 g, it was obtained, through the grating and sieving method, enough fine powder for performing a minimum of 3 determinations. The quantity of the product used in every determination was of 0.5 g of product

Method

Determinations were performed according to the crucible method described in section 7.9 of the test standard.

Equivalent Energy Value (MJ/kg) = 2402.3040

Samples	1	2	3	Average
Higher Heating Value (in MJ/kg)	8.67	8.43	10.48	9.19
Higher Heating Value (in MJ/m²)	0.16	0.15	0.19	0.17

Criteria for acceptance or rejection (according to section 11 of the test standard):
Max - Min of the 3 reproduced tests must be $\leq 0.1 \text{ MJ/m}^2$

Uncertainty associated with the measure: $\pm 0.15 \text{ MJ/kg}$

Adhesive film (M₅)

Preparation of the Samples

Starting from a minimum mass of 10 g, it was obtained, through the grating and sieving method, enough fine powder for performing a minimum of 3 determinations.
The quantity of the product used in every determination was of 0.5 g of product

Method

Determinations were performed according to the crucible method described in section 7.9 of the test standard.

Equivalent Energy Value (MJ/kg) = 2402.3040

Samples	1	2	3	Average
Higher Heating Value (in MJ/kg)	44.30	44.05	44.15	44.17
Higher Heating Value (in MJ/m²)	3.99	3.96	3.97	3.98

Criteria for acceptance or rejection (according to section 11 of the test standard):
Max - Min of the 3 reproduced tests must be $\leq 0.1 \text{ MJ/m}^2$

Uncertainty associated with the measure: $\pm 0.15 \text{ MJ/kg}$

6.1.2. - Results

Determination of the superficial density

From the data provided by the petitioner, was done the calculation of the superficial density for each component of the product.

Components	Thickness	Superficial Density
PVDF (M₃)	-	0.05 kg/m ²
Aluminium (M₁)	0.5 mm	1.3 kg/m ²
Adhesive film (M₅)	0.250 mm	0.09 kg/m ²
Hexagonal aluminium (M₂)	14 mm	1.0 kg/m ²
Paint (back face) (M₄)	-	0.018 kg/m ²
Product as a whole	-	3.848 kg/m ²

In this heterogeneous product there are different components:

- 2 external non-substantial components: PVDF (M₃) and paint (back face) (M₄)
- 1 internal non-substantial component: adhesive film (M₅)
- 2 substantial components: Aluminium (M₁) and corrugated aluminium (M₂)

Components	M ₃	M ₁	M ₅	M ₂	M ₅	M ₁	M ₄	PRODUCT
PCS (en MJ/m²)	0.97	0.00	3.98	0.00	3.98	0.00	0.17	9.09
PCS (en MJ/kg)	19.43	0.00	44.17	0.00	44.17	0.00	9.19	2.36

6.2.2.2.-**SMOGRA (in m²/sec²)**

This is defined as the maximum value of the quotient $SPR_{av}(t) / (t-300)$, multiplied by 10,000. The quotient is only calculated for the part of the time of exposure during which the levels of the thresholds for SPR_{av} and TSP were exceeded.

If one or the two threshold values are not exceeded during the period of exposure, the SMOGRA value equals zero.

TSP₆₀₀ (in m²)

This is the total amount of smoke released by the sample during the first 600 s (10 minutes) from the beginning of the exposure to the main burner.

SPR (in m²/sec):

This is the smoke production velocity.

6.2.3. – Assembly specifications

Each test set consists of two items:

- 1 part measuring 1.500 x 495 mm, which is representative of the short wing, and
- 1 part measuring 1.500 x 1.000 mm, representative of the long wing, in accordance with the specifications contained in paragraph 5.1.1.

The samples were assembled by staff of Laboratory and in accordance with the specifications provided by the petitioner.

Fixing system: The sample was fixed to the standard substrate (Calcium silicate according to UNE-EN 13238:2011) with screws.

The test was carried out removing the lateral bottom plates of the test wagon, according to section 5.2.2 a) of the test standard and with a separation of 40 mm between the rear part of the sample and the support plate.

The assembly was performed with joints. A horizontal joint at 500 mm from the bottom of the sample, and a vertical joint at 200 mm from inside corner fulfilling criteria described on section 5.2.2.e) of the test standard.

6.2.4. – Test results

6.2.4.1. – Sample n°1

Environmental conditions at the beginning of the test:

Temperature: **26 °C**

HR: **46 %**

Pressure: **99787 Pa**

Level of exposure of the burner (kW): **29.34**

INDEXES

FIGRA_{0.2 MJ} (W/s)	8.42
FIGRA_{0.4 MJ} (W/s)	8.42
LFS	< to edge
THR_{600s} (MJ)	1.16
SMOGRA (m²/s²)	0.00
TSP_{600s} (m²)	37.12
Release of inflamed material in 600 s	NO

Conditions at the end of the test:

Temperature: **26 °C**

HR:**45 %**

Pressure: **99392 Pa**

Light transmission (%): **99.02 %**

O₂ Concentration (%): **20.95 %**

CO₂ Concentration (%): **0.01 %**

6.2.4.2. - Sample n° 2

Environmental conditions at the beginning of the test:

Temperature: **25 °C**

HR: **54 %**

Pressure: **100114 Pa**

Level of exposure of the burner (kW): **28.80**

INDEXES

FIGRA_{0.2 MJ} (W/s)	51.60
FIGRA_{0.4 MJ} (W/s)	24.31
LFS	< to edge
THR_{600s} (MJ)	2.31
SMOGRA (m²/s²)	8.22
TSP_{600s} (m²)	49.31
Release of inflamed material in 600 s	NO

Conditions at the end of the test:

Temperature: **25 °C**

HR: **53 %**

Pressure: **100105 Pa**

Light transmission (%): **99.78 %**

O₂ Concentration (%): **20.95 %**

CO₂ Concentration (%): **0.01 %**

6.2.4.3. - Sample n°3

Environmental conditions at the beginning of the test:

Temperature: **26 °C**

HR: **52 %**

Pressure: **100092 Pa**

Level of exposure of the burner (kW): **28.71**

INDEXES

FIGRA_{0.2 MJ} (W/s)	54.38
FIGRA_{0.4 MJ} (W/s)	47.52
LFS	< to edge
THR_{600s} (MJ)	1.86
SMOGRA (m²/s²)	5.08
TSP_{600s} (m²)	45.78
Release of inflamed material in 600 s	NO

Conditions at the end of the test:

Temperature: **26 °C**

HR: **51 %**

Pressure: **100011 Pa**

Light transmission (%): **98.99 %**

O₂ Concentration (%): **20.94 %**

CO₂ Concentration (%): **0.02 %**

6.2.5.- Visual observations

The observation of released material or inflamed particles during the first 10 minutes of test lead to the attribution of the identification sub-index "d" to the material, so that:

d0: No release of inflamed material is observed.

d1: release of inflamed material with a flame persistence < 10 s.

d2: Release of inflamed material with a flame persistence > 10 s.

No lateral flame spread over the long wing, or release of inflamed material is observed in any of the three tested samples.

6.2.6.- Uncertainty associated to the measurement equipment

Set of thermocouples of the extraction pipe	±2°C
Pressure transmitter of the pipe	±2 Pa
Smoke measuring device	±5%
Ambient pressure measuring equipment	±5%
Ambient humidity measuring device	±5%
Ambient temperature measuring device	±2°C

6.3. – Results

Testing method	UNE-EN ISO 1716:2011
Values obtained	PCS ^(A) = 0.00 MJ/kg PCS ^(B) = 0.00 MJ/m² PCS ^(C) = 0.97 MJ/m² PCS ^(D) = 0.17 MJ/m² PCS ^(E) = 3.98 MJ/m² PCS ^(F) = 2.36 MJ/kg

(A) Substantial component (aluminium)

(B) Substantial component (hexagonal aluminium)

(C) External non-substantial component (PVDF)

(D) External non-substantial component (paint-back face)

(E) Internal non-substantial component (adhesive film)

(F) Product as a whole

6.3.2. - UNE-EN 13823:2012+A1:2016

Samples	I	II	III	Average
FIGRA_{0.2 MJ} (W/s)	8.42	51.60	54.38	38.13
FIGRA_{0.4 MJ} (W/s)	8.42	24.31	47.52	26.75
LFS	< to edge	< to edge	< to edge	< to edge
THR_{600s} (MJ)	1.16	2.31	1.86	1.78
SMOGRA (m²/s²)	0.00	8.22	5.08	4.43
TSP_{600s} (m²)	37.12	49.31	45.78	44.07
Release of inflamed material in 600 s	NO	NO	NO	NO

The test results correspond to the behaviour of test samples of a product under the testing conditions themselves. They do not intend to be the only evaluation criterion to assess the potential fire hazard involved in the use of the product.

The Euro class to which the tested product belongs is defined in Part 2 of the Classification Report.

Responsible of the fire laboratory
 LGAI Technological Center S.A. (APPLUS)

Responsible of Reaction to fire
 LGAI Technological Center S.A. (APPLUS)

The results refer exclusively to the samples tested at the time and under the conditions indicated.

The uncertainties expressed in this document pertain to the expanded uncertainty, which has been obtained by multiplying the typical measurement uncertainty by the coverage factor k=2 which, for a regular distribution, corresponds to a coverage probability of approximately 95%.

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ANNEXES

7. - PHOTOGRAPHS

8. - CHARTS

7. - PHOTOGRAPHS



Photo n°1: Detail of the corner assembly, upper view.



Photo n°2: Detail of the vertical side edge of the long wing, some 500 mm from the bottom of the support.



Photo n°3: View of the corner and anchoring system.



PHOTO nº4: View of the product prior to starting the test.



PHOTO n°5: Sample 1 – Flame attack approx. 10 minutes after the start of the test.



PHOTO n°6: Sample 1 – State of the product upon completion of the test.



PHOTO n°7: Sample 2 – Flame attack approx. 10 minutes after the start of the test.



PHOTO n°8: Sample 2 – State of the product upon completion of the test.



PHOTO n°9: Sample 3 – Flame attack approx. 10 minutes after the start of the test.



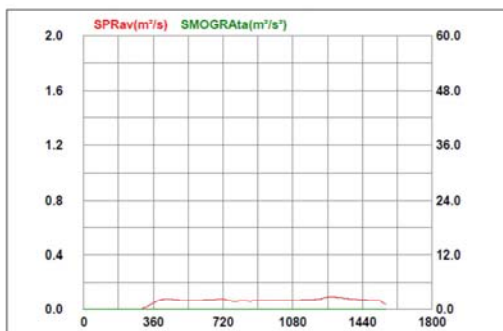
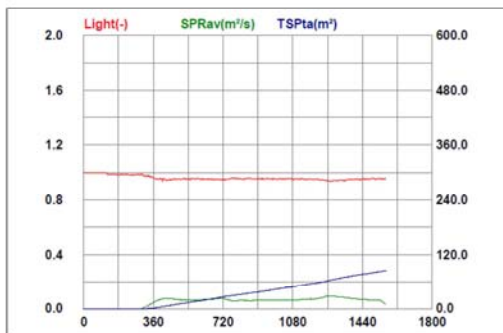
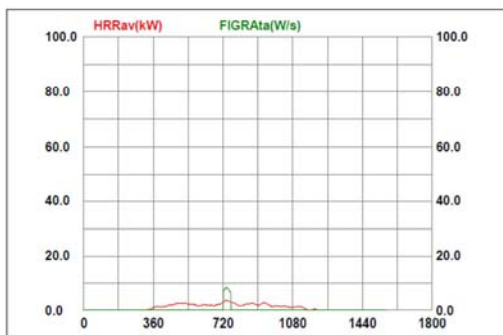
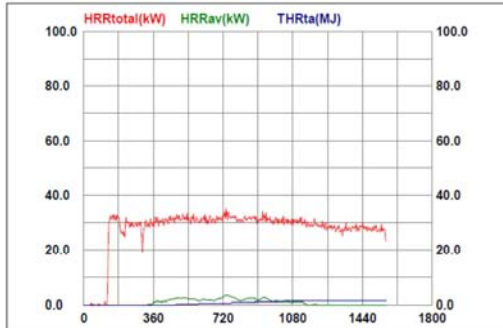
PHOTO n°10: Sample 3 – State of the product upon completion of the test.

8.- CHARTS

Sample nº1 – Ratios related to the release of heat and smoke.

Sample nº2 – Ratios related to the release of heat and smoke.

Sample nº3 – Ratios related to the release of heat and smoke.



NORMA: UNE-EN 13823:2012 + A1:2016
STANDARD

Data del test: 15:06:18 16:53
Test date

Nom del fitxer: 1120mostra1
File name

Descripció: -
Description

Client: PREMIUM BOND
Client

Material: aluminium honey comb core
Material

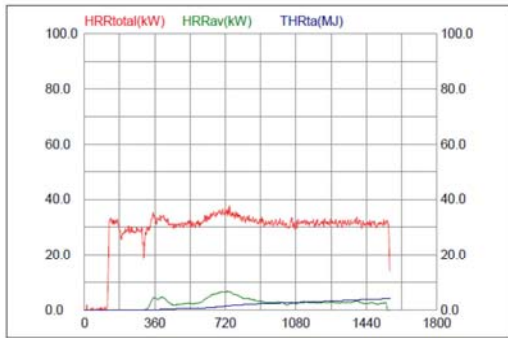
Pes (kg/m²): -
Weight(kg/m²)

Gruix: -
Thickness

HRR av: 29.34 kW

THR 600s: 1.16 MJ
FIGRA 0,2MJ: 8.42 W/s
FIGRA 0,4MJ: 8.42 W/s

TSP 600s: 37.12 m²
SMOGRA: 0.00 m²/s²



NORMA: UNE-EN 13823:2012 + A1:2016
STANDARD

Data del test: 18:06:18 10:19
Test date

Nom del fitxer: 1120mostra2c
File name

Descripció: -
Description

Client: PREMIM BOND
Client

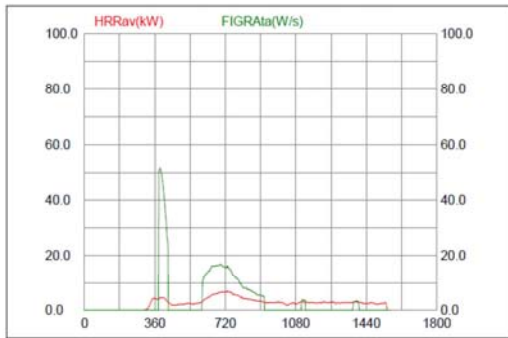
Material: aluminium honey comb core
Material

Pes (kg/m²): -
Weight(kg/m²)

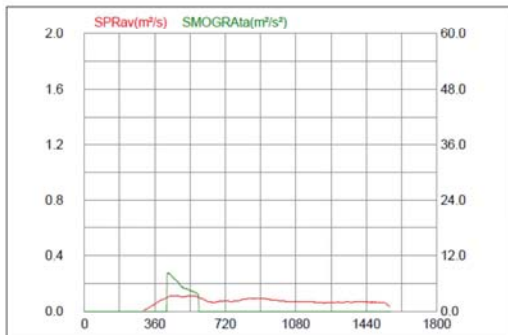
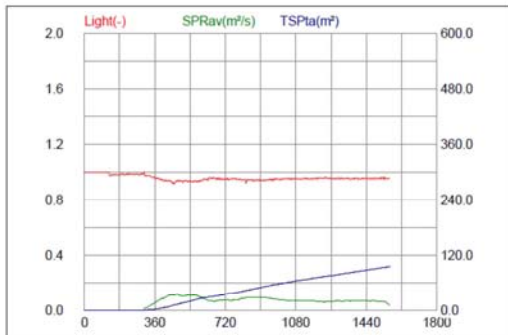
Gruix: -
Thickness

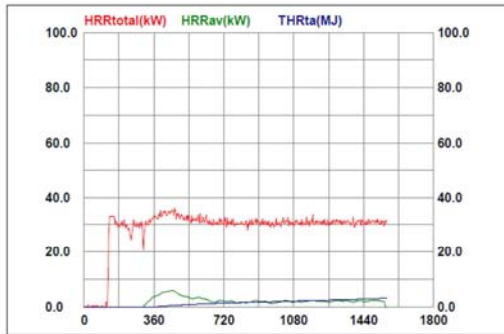
HRR av: 28.80 kW

THR 600s: 2.31 MJ
FIGRA 0,2MJ: 51.60 W/s
FIGRA 0,4MJ: 24.31 W/s



TSP 600s: 49.31 m²
SMOGRA: 8.22 m²/s²





NORMA: UNE-EN 13823:2012 + A1:2016
STANDARD

Data del test: 18:06:18 10:57
Test date

Nom del fitxer: 1120mostra3
File name

Descripció: -
Description

Client: PREMIUM BOND
Client

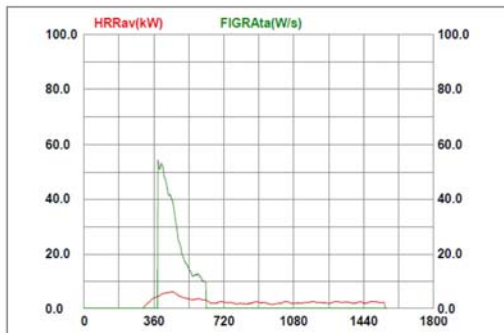
Material: aluminium honey comb core
Material

Pes (kg/m²): -
Weight(kg/m²)

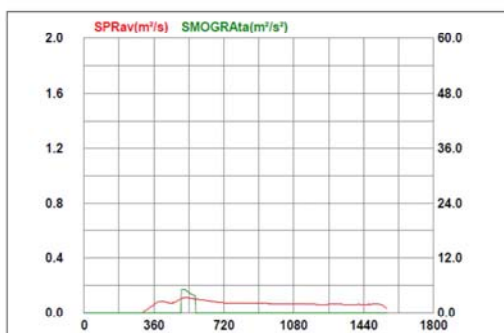
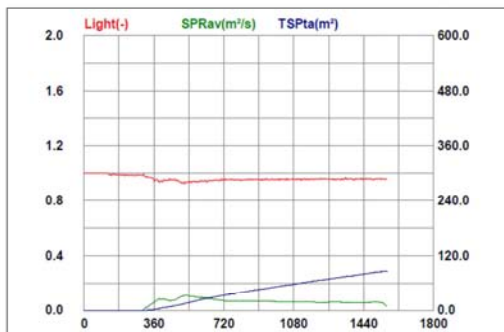
Gruix: -
Thickness

HRR av: 28.71 kW

THR 600s: 1.86 MJ
FIGRA 0,2MJ: 54.38 W/s
FIGRA 0,4MJ: 47.52 W/s



TSP 600s: 45.78 m²
SMOGRA: 5.08 m²/s²



TEST REPORT

REACTION TO FIRE TEST

Test Sponsor:

Sayyahfar & Khandadash FZC
Flexi Office: RAKEZ Business Zone – FZ
Ras Al Khaimah, United Arab Emirates

Test Material/Assembly:

Premium Bond Honeycomb Panel

Test Standard:

ASTM E84-18: Standard Test Method for Surface Burning Characteristics of Building Materials



**THOMAS BELL-WRIGHT
INTERNATIONAL CONSULTANTS**

Test Date: 3-Jun-18
Issue Date: 12-Jun-18
Test Reference No: SD144-2

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Accreditation

ISO/IEC 17025: General requirements for the competence of testing and calibration laboratories with:

United Kingdom Accreditation Service (UKAS) - Testing Laboratory: **4439**
www.ukas.com



GCC Accreditation Center (GAC) – Testing Laboratory: **ATL-0017**
www.GCC-accreditation.org



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www.egolf.org.uk

Member of International Trade Council

www.thetradecouncil.com

Member of Association for Specialist Fire Protection

www.asfp.org.uk

Member of Centre for Window and Cladding Technology

www.cwct.co.uk



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Table of Contents

1. INTRODUCTION	4
2. SPONSOR.....	4
3. MANUFACTURER.....	4
4. TESTING LABORATORY	4
5. DATE OF TEST	4
6. SPECIMEN DESCRIPTION	5
7. METHOD OF TEST.....	6
7.1. Placing of test specimen	6
7.2. Test Method.....	6
7.3. Conditioning.....	6
8. OBSERVATION	7
9. SUMMARY OF RESULTS.....	7
10. CLASSIFICATIONS	8
11. LIMITATIONS	9
12. APPENDIX 1- GRAPHS.....	10
13. APPENDIX 2- PICTURES	11



1. INTRODUCTION

Determination of the flame spread index and the smoke developed index of Premium Bond Honeycomb Panel as per ASTM E84; Standard Test Method for Surface Burning Characteristics of Building Materials.

2. SPONSOR

Name: Sayyahfar & Khandadash FZC
Address: Flexi Office: RAKEZ Business Zone – FZ
Ras Al Khaimah, United Arab Emirates

3. MANUFACTURER

Name: Premium Bond
Address: Sanat sq, Shiraz Special Economic Zone, Shiraz, Iran
Telephone: +987137175301

4. TESTING LABORATORY

Name: Thomas Bell-Wright International Consultants (TBWIC)
Address: Corner of 46th and 47th streets, Jebel Ali Industrial Area 1
P.O. Box 26385, Dubai, U.A.E.
T: +971 (0) 4 821 5777, F: +971 (0) 4 333 2693
www.bell-wright.com

5. DATE OF TEST

Sample received: 29-May-18
Test date: 3-Jun-18

The test has not been witnessed by the Sponsor.



6. SPECIMEN DESCRIPTION

The description of the specimen given below has been prepared from information provided by the Sponsor.

Product Description		Aluminium Foil Sandwiching an Aluminium Hexagonal Structure	
Product Reference		Premium Bond Honeycomb Panel	
Fire side		Coated Side	
Total Thickness		15mm (stated and measured)	
Total Area Density		3.6 kg/m ² (stated)	
Product Details	1st Layer Coating (Fire Side)	Material	Polyvinylidene fluoride (PVDF) Coating
		Application method	Spray and Oven baked
		Number of coats	2
	2nd Layer	Material	Aluminium
		Thickness	0.5mm
		Area Density	1.3 kg/m ²
	3rd Layer	Material	Adhesive film
		Thickness	0.250mm
		Area Density	250 g/m ²
	4th Layer	Material	Hexagonal Aluminium
		Thickness	14mm
		Area Density	1 kg/m ²
	5th Layer	Material	Adhesive film
		Thickness	0.250mm
		Area Density	250 g/m ²
	6th Layer	Material	Aluminium
		Thickness	0.5mm
		Area Density	1.3 kg/m ²
Dimensions per panel		800 x 600mm (l x w x thk.) (measured)	
No. of panel		9	
Total dimension		7200 x 600mm (l x w x thk.) (measured)	
Specimen placement		The nine (9) sections of Premium Bond Honeycomb Panel were butt jointed end-to-end and were placed directly to the tunnel ledges with the exposed coated surface towards the flame source.	

The test specimen was submitted by the client and TBWIC has not been involved in the selection and configuration of the specimen.



7. METHOD OF TEST

7.1. Placing of test specimen

The test specimen consisted of 9 panels of Premium Bond Honeycomb Panel. The total dimensions of the specimen were 7200 x 600mm (l x w).

Several sections of cement board butt jointed end-to-end with overall dimensions of 7350 x 600mm (l x w), were placed at the back of the sample to protect the furnace lid assembly.

7.2. Test Method

The specimen was installed horizontally in the Steiner Tunnel and supported by the ledges. The coated surface of the specimen was exposed to a flaming exposure during the 10 minute test duration.

Flame spread and density of the smoke are measured and recorded while the results are computed against the standard calibration materials (cement board and red oak flooring).

7.3. Conditioning

After delivery on 29-May-18, the specimen was stored in room temperature for 5 days prior to the test ranging from 20.2 to 25.8°C and 45 to 55% relative humidity.



8. OBSERVATION

Test Data and Observation

Observations	
Ignition Time (min:sec)	0:37
Time to maximum flame front advance (min:sec)	8:23
Maximum flame spread (ft)	19.5
Time to end of tunnel reached (min:sec)	8:23
Maximum temp recorded at the exposed thermocouple located near the end of the tunnel (°F / °C)	1211/655
Dripping (min:sec)	6:04
Flaming on the floor (min:sec)	6:38
After flame on the top (min:sec)	Note 1
After flame on the floor (min:sec)	None
Delamination (min:sec)	None
Sagging (min:sec)	None
Shrinkage (min:sec)	None
Fallout (min:sec)	7:15
FS*Time Area (ft*min)	65.47
Smoke Area (%A*min)	288.99
Red Oak Smoke Area (%A*min)	92.1

Note 1 – The flame was extinguished immediately due to the continuous burning of the specimen after the 10 minutes test; therefore, after flame on the top was not observed.

9. SUMMARY OF RESULTS

The test specimen has been evaluated in accordance with ASTM E84; Standard Test Method for Surface Burning Characteristics of Building Materials.

The test results are:

FLAME SPREAD INDEX (FSI)	35
SMOKE DEVELOPED INDEX (SDI)	300

Results are valid for the tested configuration only.



10. CLASSIFICATIONS

The following information is designed to help put these test results into context. Flame Spread Index and Smoke Developed Index results from an ASTM E84 test are often used by regulatory agencies to approve materials for various applications. For example, the International Building Code 2015, Section 803.1.1 requires that:

Interior wall and ceiling finish materials shall be classified in accordance with ASTM E84 or UL 723-10th Ed. 2008. Such interior finish materials shall be grouped in the following classes in accordance with their flame spread and smoke-developed indexes.

Class A: Flame spread index 0 - 25; smoke-developed index 0 - 450.

Class B: Flame spread index 26 - 75; smoke-developed index 0 - 450.

Class C: Flame spread index 76 - 200; smoke-developed index 0 - 450.

Note that the above example is the IBC requirement for interior wall and ceiling finishes only; your application may be different.



11. LIMITATIONS

Testing of materials that melt, drip, or delaminate to such a degree that the continuity of the flame front is destroyed, results in low flame spread indices that do not relate directly to indices obtained by the testing materials that remain in place


Thomas Bell-Wright International Consultants recommend that the relevance of test reports should be considered after a period of five years.

This test report is respectfully submitted by: Thomas Bell-Wright International Consultants

Prepared/Tested By:


Rachel Marie Novelo
Fire Testing Engineer

Reviewed By:

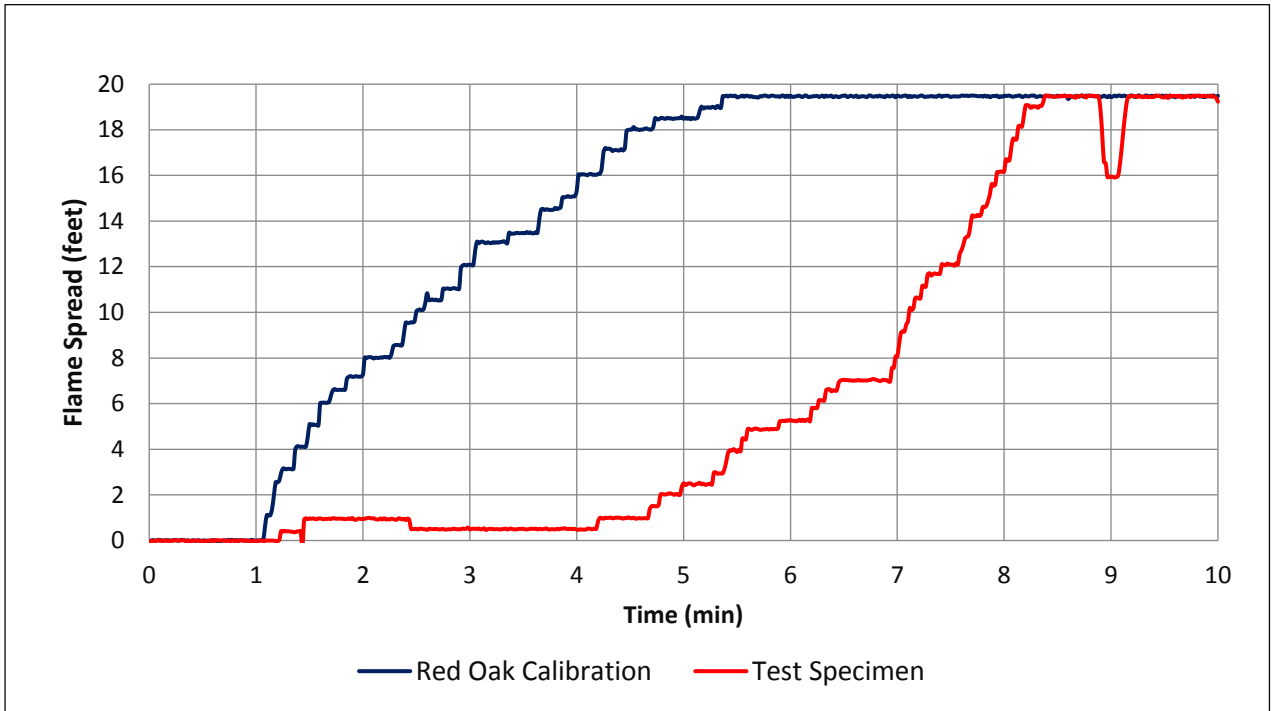

Fredilyn Paragoso
Fire Testing Support Engineer

Approved By:

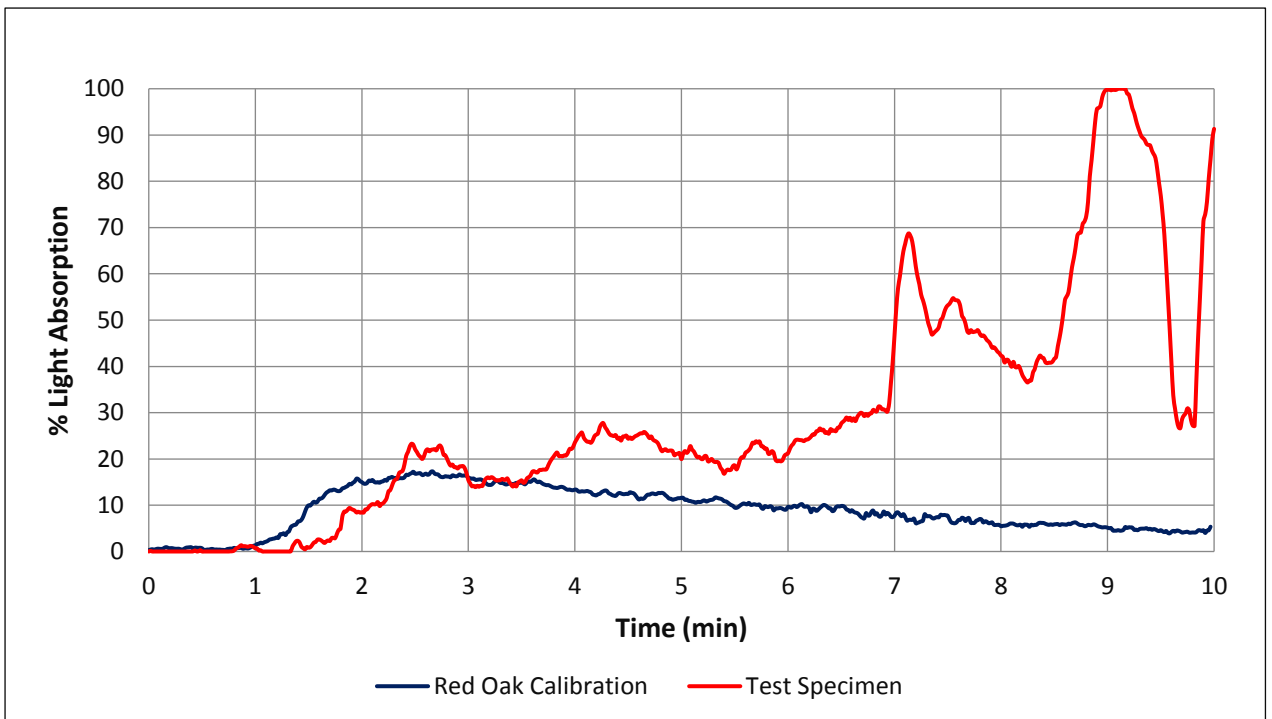

Suketa Tyagi
Reaction to Fire - Manager




12. APPENDIX 1- GRAPHS



Graph 1: Flame Spread Index (FSI)



Graph 2: Smoke Developed Index (SDI)



13. APPENDIX 2- PICTURES



**Photo 1: Specimen before the test.
(Non-Fire Side)**



**Photo 2: Specimen before the test.
(Fire Side)**



**Photo 3: Specimen after the test.
(As seen from the fire-end)**



**Photo 4: Specimen after the test.
(As seen from the exhaust end)**

----- End of Test Report -----