Client's name	:	**VAN LIEN CO., LTD**
Client's address	:	**126A5 LIEN KHU 5-6 STR, BINH HUNG HOA B WARD, BINH TAN DIST., HCMC, VIETNAM**

The following sample(s) was/were submitted and identified by the client as:

Name of sample	:	**BELLDUCT ALUMINIUM FLEXIBLE DUCT 32kg/m^3 - 25mmT**
Quantity	:	**01 sample**
Date of receiving	:	**02-Apr-2019**
Date of testing	:	**From 02-Apr-2019 to 10-Apr-2019**
Test Requested	:	**BS 476 Part 6:1989+A1:2009 Incorporating Corrigendum No.1:2014 "Fire tests on building materials and structures Part 6: Method of test for propagation for products".** **BS 476 Part 7:1997 Incorporating Corrigendum No.1:2014 "Fire tests on building materials and structures Part 7: Method of test to determine the classification of the surface spread of flame of products".**
Test result	:	**See next page(s)**

The following sample(s) was / were submitted and identified on behalf of the client. SGS is not responsible for the authenticity, integrity and results of the data and information and / or the validity of the conclusion. results apply to the sample as received.

Classification:

It is the opinion of this laboratory that, the tested sample complies with the requirement of Class 0 of UK. Building Regulations 2006 Approved Document B, appendix A paragraph 13.

Signed for and on behalf of
SGS Vietnam LTD

To Duc Tien
Technical Manager
Industrial Services

1. BS 476 Part 6:1989 + A1:2009 *Incorporating Corrigendum No.1:2014*

I. Test conducted

This test was performed in accordance with the procedure specified in BS 476 Part 6:1989 + A1:2009 *Incorporating Corrigendum No.1:2014* "Fire tests on building materials and structures—Part 6: Method of test for fire propagation for products".

II. Sample details

Sample description	Aluminum foil & glass fiber & aluminum foil
Thickness	About 30mm
Color	Silver
Specimen size	225mm×225mm

III. Test details

Conditioning of specimens:	Prior to testing, the sample was conditioned to constant mass at a temperature of 23 ± 2 °C, and a relative humidity of 50 ± 5 %, and maintained in this condition until required for testing.
Exposed Face:	Aluminum foil surface
Form in which the specimens were tested:	Composite

IV. Test results

Throughout the test on each specimen, carefully observe the material's behaviour within the apparatus and take special note of any of the following 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 index of the performance for the specimen was determined as follows:

$$S_1 = \sum_{t=0.5}^{t=3} \frac{\theta_s - \theta_c}{10t},\ S_2 = \sum_{t=4}^{t=10} \frac{\theta_s - \theta_c}{10t},\ S_3 = \sum_{t=12}^{t=20} \frac{\theta_s - \theta_c}{10t},\ S = S_1 + S_2 + S_3$$

Where:

S = index of performance for each of the specimens tested and S1, S2 and S3 are sub- indices

t = Time in minutes from the origin at which readings are taken

θ_s = Temperature rise in ℃ for the specimen at time, t

θ_c = Temperature rise in ℃ for the calibration sheet at time, t

★★★ TO BE CONTINUED ★★★

Fire Propagation index $I = i_1 + i_2 + i_3$

Where, i_1, i_2 and i_3 are given by the expressions:

$$i_1 = \frac{1}{3}[(S_1)_A + (S_1)_B + (S_1)_C],\ i_2 = \frac{1}{3}[(S_2)_A + (S_2)_B + (S_2)_C],\ i_3 = \frac{1}{3}[(S_3)_A + (S_3)_B + (S_3)_C]$$

The following test results were obtained for each specimen tested:

Specimen No.	Sub - indices			Index of performance
	S_1	S_2	S_3	S
A	1.54	1.06	0.42	3.02
B	1.87	1.23	0.42	3.52
C	1.87	1.27	0.47	3.61

Number of Specimens tested	Sub-index i_1	Sub-index i_2	Sub-index i_3	Fire Propagation index I
3	1.76	1.19	0.44	3.39

Note: If a suffix "R" is included in the above fire propagation index I, this indicates that the results should be treated with caution.

*** TO BE CONTINUED ***

2. BS 476 Part 7:1997 *Incorporating Corrigendum No.1:2014*

I. Test conducted

This test was performed in accordance with the procedure specified in BS 476 Part 7:1997 *Incorporating Corrigendum No.1:2014* "Fire tests on building materials and structures Part 7. Method of test to determine the classification of the surface spread of flame of products".

II. Sample details

Sample description	Aluminum foil & glass fiber & aluminum foil
Thickness	About 30mm
Color	Silver
Specimen size	885mm×270mm

III. Test details

Conditioning of specimens:	Prior to testing, the sample was conditioned to constant mass at a temperature of 23 ± 2 °C, and a relative humidity of 50 ± 10 %, and maintained in this condition until required for testing.
Exposed Face:	Aluminum foil surface

Irradiance along horizontal reference line on the calibration board

Distance along reference line from inside edge of specimen holder	Irradiance kW/m²		
mm	Specified	Min.	Max.
75	32.5	32.0	33.0
225	21.0	20.5	21.5
375	14.5	14.0	15.0
525	10.0	9.5	10.5
675	7.0	6.5	7.5
825	5.0	4.5	5.5

★★★ TO BE CONTINUED ★★★

IV. Test results

SPECIMEN No.	1	2	3	4	5	6
Distance (mm)	Time to travel to indicated distance (minutes :seconds)					
75	--	--	--	--	--	--
165	--	--	--	--	--	--
190	--	--	--	--	--	--
215	--	--	--	--	--	--
240	--	--	--	--	--	--
265	--	--	--	--	--	--
290	--	--	--	--	--	--
375	--	--	--	--	--	--
455	--	--	--	--	--	--
500	--	--	--	--	--	--
525	--	--	--	--	--	--
600	--	--	--	--	--	--
675	--	--	--	--	--	--
710	--	--	--	--	--	--
750	--	--	--	--	--	--
785	--	--	--	--	--	--
825	--	--	--	--	--	--
Maximum distance traveled at 1.5 minutes (mm)	<50	<50	<50	<50	<50	<50
Maximum distance traveled during the whole test (mm)	<50	<50	<50	<50	<50	<50
Time to reach maximum distance traveled	1min	1min	1min	1min	1min	1min

Note: 1. "--" Not reached the reference line

2. Six specimens are usually tested. If the test on any specimen is deemed to be invalid, as defined in the standard, it is permissible for up to a maximum of nine specimens to be tested in order to obtain the six valid test results.

The classification limits specified in BS 476 Part 7:1997 *Incorporating Corrigendum No.1:2014* are given in Appendix 1.

Observations during test: None

✶✶✶ TO BE CONTINUED ✶✶✶

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 prefix and suffixes is given in Appendix 2.

Appendix 1 Classification of spread of flame

Classification	Spread of flame at 1.5 min		Final spread of flame	
	Limit (mm)	Limit for one specimen in sample(mm)	Limit (mm)	Limit for one specimen in sample(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			

Appendix 2 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 conform to the surface characteristics specified in the standard and has therefore been tested in a modified form (e.g. class D3).
3. A suffix Y shall be added to the classification if any softening and/or other behaviour that may affect the flame spread occurs.

Classification: In accordance with the class definitions given in BS 476 Part 7:1997 *Incorporating Corrigendum No.1:2014*, the tested sample is classified as **Class 1**.

Requirements:

A Class 0 is the highest national product performance classification for lining materials, and the requirements laid down in the UK Building Regulation 2006 Approved Document B, appendix A paragraph 13. This is achieved if a material or the surface of a composite product is either:

a. composed throughout of materials of a limited combustibility; or

b. a Class I materials which has a fire propagation index (I) of not more than 12 and sub-index (i_1) of not more than 6.

★★★ TO BE CONTINUED ★★★

Statements:

This declaration of conformity is only based on the result of this laboratory activity, the impact of the uncertainty of the results was not included."

The test results relate to the behaviour of the test specimens 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 product in use.

The test results relate only to the specimens of the product in the form in which 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.

Photo Appendix:

	
BS 476 Part 6:1989 + A1:2009 *Incorporating Corrigendum No.1:2014*	BS 476 Part 7:1997 *Incorporating Corrigendum No.1:2014*

SGS authenticate the photo on original report only

Note: The above tests were performed by SGS China.

This Report cancels and supersedes the Report No. 505222-142 dated 12-Apr-2019 issued by SGS Vietnam Ltd.

★★★ END OF THE REPORT ★★★

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