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SUBJECT:

Fire propagation test on Brand: "Virgo", Model: "SF 140001", Virgo Compact Grade Laminate submitted by Virgo Pacific Pte Ltd on 14 Jan 2025.

TESTED FOR:

Virgo Pacific Pte Ltd
5 Sungei Kadut Street 2
#06-02, Trendspace
Singapore 729227

DATE OF TEST:

21 Mar 2025

PURPOSE OF TEST:

To determine the Index of Performance of the material when it is exposed to the conditions of the test specified in British Standard 476 : Part 6 : 1989 + A1 : 2009 "Method of test for fire propagation for products".

The test was conducted at TÜV SÜD PSB's fire test laboratory located at No. 10 Tuas Avenue 10, Singapore 639134.

TÜV SÜD PSB

ilac-MRA Accredited Laboratory SAC-SINGLAS

LA-2007-0380-A LA-2007-0386-C
LA-2007-0381-F LA-2010-0464-D
LA-2007-0382-B LA-2018-0702-B
LA-2007-0383-G LA-2018-0703-G
LA-2007-0384-G LA-2020-0747-L
LA-2007-0385-E

The results reported herein have been performed in accordance with the terms of accreditation under the Singapore Accreditation Council. Inspections/Calibrations/Tests marked "Not SAC-SINGLAS Accredited" in this Report are not included in the SAC-SINGLAS Accreditation Schedule for our inspection body/laboratory.

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DESCRIPTION OF SPECIMENS:

Six pieces of specimen, said to be Brand: "Virgo", Model: "SF 140001", Virgo Compact Grade Laminate, each of nominal test size of 225mm x 225mm were received. The thickness, mass per unit area and bulk density of the specimen were measured to be 12mm, 16.9kg/m^2 and 1414kg/m^3 respectively.

Details of the product, as provided by the sponsor of test, are as follows:

Brand	Virgo
Model reference	SF 140001
Generic product name	Virgo Compact Grade Laminate
Material composition	Malamine Decorative Paper and Phenolic Kraft Paper
Country of Origin	India
Nominal thickness	12mm
Nominal mass per unit area	N/A
Nominal density	N/A
Fire retardant	Confidential FR Phenol Resin formulation

TEST PROCEDURE:

Prior to test, the specimens were prepared and conditioned in accordance with paragraph 4.4 of the standard.

Three specimens, backed with non-combustible board, were tested with either face exposed to the specified heating conditions, in an apparatus conforming to paragraph 5 and illustrated in Figures 1 to 3 of the Standard.

The calibration and test procedures were as defined in paragraphs 8 and 9, respectively, of the specification. The apparatus was calibrated prior to test and the actual calibration curve obtained is shown in Figure 1 of this report.

The mean temperature rise above ambient obtained from three specimens is also shown in Figure 1 (i.e. with the actual calibration curve). The mean temperature readings for the material and the calibration curve were obtained at the following intervals from the start of the test: at 1/2 minute intervals up to 3 minutes, at 1 minute intervals from 4 to 10 minutes, and at 2 minutes intervals from 12 to 20 minutes.

From these readings, the index of performance for the material was determined as follows:

$$s_1 = \sum_{t=0.5}^{t=3} \frac{\Theta_s - \Theta_c}{10t}; \quad s_2 = \sum_{t=4}^{t=10} \frac{\Theta_s - \Theta_c}{10t}$$

and $$s_3 = \sum_{t=12}^{t=20} \frac{\Theta_s - \Theta_c}{10t};$$

$$S = s_1 + s_2 + s_3$$

where S = Index of performance for each of the specimens tested and s_1, s_2 and s_3 are sub-indices

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

Θ_s = Temperature rise in deg. C for the specimen at time, t

Θ_c = Temperature rise in deg. C for the calibration sheet at time, t

In computations only the positive value of $\frac{\Theta_s - \Theta_c}{10t}$ was used.

RESULTS OF TEST:

The following test results were obtained for each specimen tested:

Specimen	Sub-Indices			Index of Performance
	s_1	s_2	s_3	S
A	2.5	6.8	5.9	15.2
B	2.0	7.3	6.1	15.4
C	2.6	7.3	6.2	16.1

CONCLUSION:

The test results obtained, as an average of the 3 samples tested are as follows:

Index of overall performance, I = 15.6
(Fire propagation index)

Sub-index, i_1 = 2.4

Sub-index, i_2 = 7.1

Sub-index, i_3 = 6.1

REMARKS:

1. 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.

2. Photograph of specimen is shown in Plate 1.

Ye Wint Aung
Senior Associate Engineer

Chan Lung Toa
Assistant Vice President
Fire Testing
Mechanical Centre

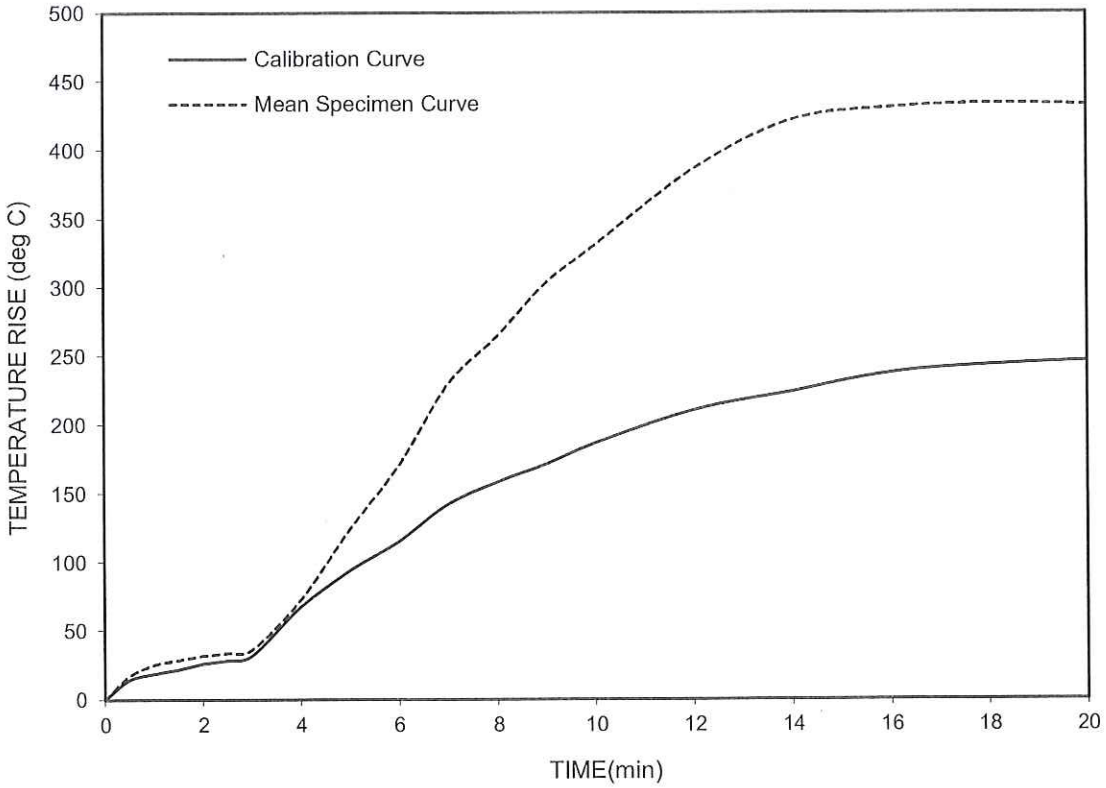

FIGURE 1 : COMPARISON OF MEAN SPECIMEN AND CALIBRATION CURVES

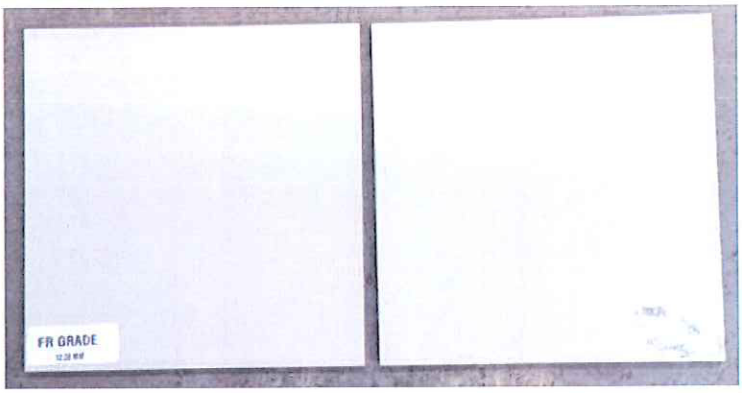

Plate 1: Photograph of specimen

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1. This report applies to the sample of the specific product/equipment given at the time of its testing/calibration. The results are not used to indicate or imply that they are applicable to other similar items. In addition, such results must not be used to indicate or imply that TÜV SÜD PSB approves, recommends or endorses the manufacturer, supplier or user of such product/equipment, or that TÜV SÜD PSB in any way "guarantees" the later performance of the product/equipment. Unless otherwise stated in this report, no tests were conducted to determine long term effects of using the specific product/equipment.

2. The sample/s mentioned in this report is/are submitted/supplied/manufactured by the Client. TÜV SÜD PSB therefore assumes no responsibility for the accuracy of information on the brand name, model number, origin of manufacture, consignment or any information supplied.

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5. Unless otherwise stated, the tests were carried out in TÜV SÜD PSB Pte Ltd, 15 International Business Park TÜV SÜD @ IBP Singapore 609937.

6. The tests carried out by TÜV SÜD PSB and this report are subject to TÜV SÜD PSB's General Terms and Conditions of Business and the Testing, Certification, Validation and Verification Regulations (TCVVR) of the TÜV SÜD Group.

Effective 27 March 2024

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SUBJECT:

Surface spread of flame test on Brand: "Virgo", Model: "SF 140001", Virgo Compact Grade Laminate submitted by Virgo Pacific Pte Ltd on 14 Jan 2025.

TESTED FOR:

Virgo Pacific Pte Ltd
5 Sungei Kadut Street 2
#06-02, Trendspace
Singapore 729227

DATE OF TEST:

27 Feb 2025

PURPOSE OF TEST:

To determine the tendency of the surface of a material or a combination of materials to support the spread of flame across its surface and to classify the surface according to the test given in British Standard 476 : Part 7 : 1997 "Method of test to determine the classification of the surface spread of flame of products".

The test was conducted at TÜV SÜD PSB's fire test laboratory located at No. 10 Tuas Avenue 10, Singapore 639134.

TÜV SÜD PSB

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LA-2007-0380-A LA-2007-0386-C
LA-2007-0381-F LA-2010-0464-D
LA-2007-0382-B LA-2018-0702-B
LA-2007-0383-G LA-2018-0703-G
LA-2007-0384-G LA-2020-0747-L
LA-2007-0385-E

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Regional Head Office:
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Singapore 609937

DESCRIPTION OF SPECIMENS:

Nine pieces of specimen, said to be Brand: "Virgo", Model: "SF 140001", Virgo Compact Grade Laminate, each of nominal test size of 885mm x 270mm were received. The thickness, mass per unit area and bulk density of the specimen were measured to be 12mm, 16.9kg/m^2 and 1414kg/m^3 respectively.

Details of the product, as provided by the sponsor of test, are as follows:

Brand	Virgo
Model reference	SF 140001
Generic product name	Virgo Compact Grade Laminate
Material composition	Malamine Decorative Paper and Phenolic Kraft Paper
Country of Origin	India
Nominal thickness	12mm
Nominal mass per unit area	N/A
Nominal density	N/A
Fire retardant	Confidential FR Phenol Resin formulation

TEST PROCEDURE:

Prior to test, the specimens were prepared and conditioned in accordance with paragraphs 5.3 to 5.6 of the standard and secured to a specimen holder as described in paragraph 6.3.

Six specimens, backed with non-combustible board, were tested with either face exposed to the specified thermal radiation from the apparatus described in paragraph 6.1 of the standard. The intensity of the radiated heat incident on the specimen varies with distance from the hotter end, so that when the specified calibration panel is mounted in the place to be occupied by the specimen, the irradiance of the radiometer is as given in Table 1. The test was terminated when the flame front reached the 825mm reference line, or after 10 minutes has elapsed, whichever is the shorter.

Table 1 : Irradiance Along Horizontal Reference Line on the Calibration Board

Distance along reference line from inside edge of specimen holder	Irradiance kW/m^2		
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

RESULTS OF TEST:

Specimen No.	1	2	3	4	5	6
Spread of flame at first 1½ minutes (mm)	0	0	0	0	0	0
Distance (mm)	Time of spread of flame to indicated distance (minutes • seconds)					
Start of flaming	nil	nil	nil	nil	nil	nil
75 165 190 215 240 265 290 375 455 500 525 600 675 710 750 785 825 865	-	-	-	-	-	-
Time of maximum spread of flame (minutes • seconds)	-	-	-	-	-	-
Distance of maximum spread of flame (mm)	0	0	0	0	0	0
Comments	None					

Classification of Surface 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			

CONCLUSION:

In accordance with the class definitions specified in the Standard, the test results show that the sample tested has a Class 1 Surface Spread of Flame.

REMARKS:

1. 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.
2. Photograph of specimen is shown in Plate 1.

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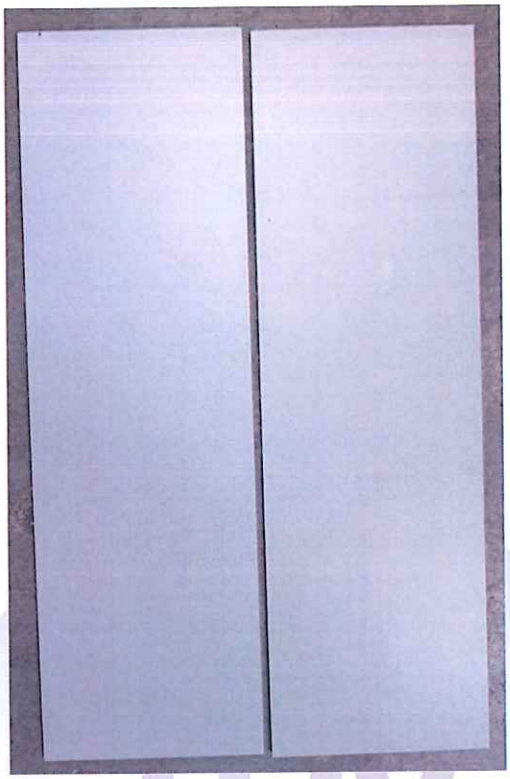

Plate 1: Photograph of specimen

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