

Cedar Decor Pvt. Ltd.

Mr. Dipen Bhavsar

A-1 10th Floor, Palladium Building, Corporate Road

Makarba

380-015 Ahmedabad - Gujarat

INDIEN



Dresden, 27/09/2024

SWEN

Test Report Order no. 2724393

Client: Cedar Decor Pvt. Ltd.
A-1 10th Floor, Palladium Building, Corporate Road
Makarba
380-015 Ahmedabad - Gujarat
India

Order: Performance of selected tests according to EN 438-2:2016

Contractor: Entwicklungs- und Prueflabor Holztechnologie GmbH
Laboratory Unit Surface Testing
Zellescher Weg 24
01217 Dresden
Germany

Engineer in charge: Dipl.- Ing. S. Wenk



Dipl.-Ing. Andreas Möschner

Head of Laboratory Laboratory Unit Surface Testing

The test report contains 10 pages. Any duplication of extracts requires the written permission of EPH. The test results refer exclusively to the material tested.

1 Task

The accredited Entwicklungs und Prueflabor Holztechnologie GmbH was instructed by Cedar Decor Pvt. Ltd. to conduct out selected tests according to EN 438-2:2016.

NOTE: All numerical values within this document are given with a comma as decimal.

2 Sample material

The following compact laminate samples and information were selected for testing and submitted to the contractor by the client.

Date of sample receipt: 12/08/2024

Sample identification (Sample ID, coded by the client)	Test pieces / Dimensions [mm]
High Pressure Laminate	12 / 100 x 100 x 0,8 ; 5 / 50 x 50 x 0,8 ; 12 / 230 x 230 x 0,8 ; 9 / 200 x 50 x 0,8 ; 4 / 300 x 200 x 0,8 ; 6 / 150 x 50 x 0,8

3 Test performance

3.1 Determination of thickness

The test for determination of thickness was performed according to EN 438-2:2016-02 part 5 at the test pieces for determination of resistance to immersion in boiling water. 4 measuring points were marked on each test piece.

The test was carried out: 22/08/2024

3.2 Determination of the resistance to surface wear

The test of the behaviour under abrasion stress was carried out according to the method described in EN 438-2:2016-02, part 10, using a Taber Abraser Tester 352 G (Typ 5135) from Taber Industries (test equipment OF-120). The friction wheels had a Shore A of 65 and were fitted with the sanding paper type S42. The loss of mass during calibration of the abrasive paper was 100 mg, which corresponds to the requirement (120 ± 20) mg.

The test was carried out: 26/08/2024

3.3 Determination of the resistance to immersion in boiling water

The test of resistance to immersion in boiling water was carried out according to EN 438-2:2016-02 part 12. The effects of immersion in boiling water for 2 h by means of the increase in mass and thickness of the test specimens and by detecting changes in appearance (surface and edge).

The test was carried out: 22/08/2024

3.4 Determination of substrate protection against water vapour

The test of resistance to protection of the substrate against water vapour was carried out according to EN 438-2:2016-02 part 13.

The increase in thickness that results when the surface into which a groove has been milled is exposed to water vapour for one hour was determined. The thickness measurement was performed before exposing to water vapour and after removing the test pieces from the water vapour, immediately.

The test was carried out: 13/09/2024

3.5 Determination of the resistance against water vapour

The test of the resistance to water vapour was carried out according to EN 438-2:2016-02, part 14.

A specimen to be tested is held over the neck of a flask of boiling water in such a way that the decorative surface of the specimen is exposed to water vapour. After 1 hour the specimen is removed and stored for 24 hours under normal ambient conditions for recovery before being examined for changes in appearance.

The test was carried out: 19/08/2024 - 20/08/2024

3.6 Determination of the resistance to dry heat

The test of resistance to dry heat was carried out according to EN 438-2:2016-02, part 16.

A block of a standardised aluminium alloy was heated at a specified test temperature of 160 °C was brought into contact with a specimen taken from one of the laminates to be tested, which was glued to a particle board. After a contact period of 20 minutes the block was removed. Resistance to these test conditions was assessed by visual inspection.

The test was carried out: 27/08/2024 - 28/08/2024

3.7 Determination of the dimension stability at elevated temperature

The test of dimensional stability at elevated temperature was carried out according to EN 438-2:2016-02, part 17.

In this test, the changes in the lateral dimensions of specimens of the laminates to be tested were determined over an extreme range of relative humidity at elevated temperatures.

The test was carried out: 15/08/2024 – 19/08/2024

3.8 Determination of the resistance to impact by small-diameter ball

The resistance to impact by small-diameter ball was carried out in accordance with EN 438-2:2016-02, part 206, using the small ball impact device (test equipment - OF 02) described in the standard.

The test was carried out: 26/08/2024

3.9 Determination of the resistance to impact by large-diameter ball

The determination of the resistance to impact with a large ball was carried out according to EN 438-2:2016-02, part 21, using the large ball impact device (test equipment - OF 44) described in the standard.

The test was carried out: 28/08/2024

3.10 Determination of the susceptibility to cracking under stress

The determination of the Susceptibility to cracking under stress was carried out according to EN 438-2:2016-02, part 23.

A test specimen of the laminate to be tested was exposed by heating to 50 °C for 6 h and the susceptibility to stress cracking was assessed by visual inspection after cooling.

The test was carried out: 28/08/2024

3.11 Determination of resistance to scratching

The determination of the resistance to scratching was carried out according to EN 438-2:2016-02, part 25. A Universal Scratch Tester Model 413 from Erichsen (test equipment OF-45) was used as a testing device. The evaluation of the results was carried out using reference samples according to EN 438-2:2016-02, Figure 22, and the evaluation scale from Table 6, part 25.7.

The test was carried out: 23/08/2024

3.12 Determination of the resistance to staining

The determination of the resistance to staining was carried out with 5 selected staining substances from groups 1 - 3 according to EN 438-2:2016-02, part 26.

The test was carried out: 27/08/2024 - 28/08/2024

3.13 Sample preparation (bonding to chipboard material)

The variants 2 and 8 were bonded to chipboard material using PUR adhesive according to EN 438-2:2016-02 for the tests 3.3, 3.4 and 3.6.

4 Results

4.1 Thickness

Thickness in mm test specimen			Thickness in mm (mean value)
1	2	3	
0,85; 0,85; 0,85; 0,85 mean: 0,85	0,88; 0,87; 0,88; 0,88 mean: 0,88	0,85; 0,85; 0,86; 0,85 mean: 0,85	0,86
Maximum deviation in thickness: 0,03 mm (within the product)			

4.2 Resistance to surface wear

Number of revolutions until the initial abrasion point (IP) is reached test specimen			Resistance to surface abrasion up to IP (mean value rounded to 50)
1	2	3	
440	460	470	460

4.3 Resistance to immersion in boiling water

4.3.1 Increase of mass

Increase of mass after 2 h water storage in % (n = 3)
5,0

4.3.2 Increase of thickness

Increase of thickness after 2 h water storage in % (n = 3)
4,6

4.3.3 Visual Examination (changing the appearance of the surface and edge)

Visual assessment after 2 h water storage in rating	
Surface	Edge
5	5

Evaluation criteria according to EN 438-2:2016-02 part 12:

- Grade 5 no visible change
- Grade 4 slight change of gloss and/or colour, only visible at certain viewing angles
- Grade 3 moderate change of gloss and/or colour
- Grade 2 marked change of gloss and/or colour
- Grade 1 blistering and/or delamination

4.4 Substrate protection against water vapour

Increase of thickness after 1 h exposition to water vapour in mm		
Test piece 1	Test piece 2	Maximum
0,0	0,1	0,1

4.5 Resistance against water vapour

Result of the visual examination in rating
Grade 5

Evaluation criteria according to EN 438-2:2016-02 part 14:

Grade 5	no visible change
Grade 4	slight change of gloss and/or colour, only visible at certain viewing angles
Grade 3	moderate change of gloss and/or colour
Grade 2	marked change of gloss and/or colour
Grade 1	blistering and/or delamination

4.6 Resistance against dry heat

Result of the visual examination in rating by 160 °C
Grade 4

Rating scale according to EN 438-2:2016-02 table 1

Grade 5	<i>No change</i> test area indistinguishable from adjacent surrounding area
Grade 4	<i>Slight change</i> test area distinguishable from adjacent surrounding area, only when the light source is mirrored on the test surface and is reflected towards the observer's eye, e.g. discoloration, change in gloss and colour
Grade 3	<i>Moderate change</i> test area distinguishable from adjacent surrounding area, visible in several viewing directions, e.g. discoloration, change in gloss and colour, no change in the surface structure, e.g. deformation, cracking, blistering
Grade 2	<i>Significant change</i> test area clearly distinguishable from adjacent surrounding area, visible in all viewing directions, e.g. discoloration, change in gloss and colour and/or the structure of the surface slightly changed, e.g. slight cracking, slight blistering
Grade 1	<i>Strong change</i> The structure of the surface being distingly changed e.g. strong cracking, strong blistering and/or discoloration, change in gloss and colour and/or the surface material being totally or partially delaminated

4.7 Dimension stability at elevated temperature

Dimension stability at elevated temperature in %	
L (longitudinal)	T (transversal)
0,45	0,80

4.8 Determination of the resistance to impact by small-diameter ball

Determined impact resistance with the small ball - Maximum spring force in N			
Single value e			Mean value
26,7	26,7	27,8	27

4.9 Determination of the resistance to impact by large-diameter ball

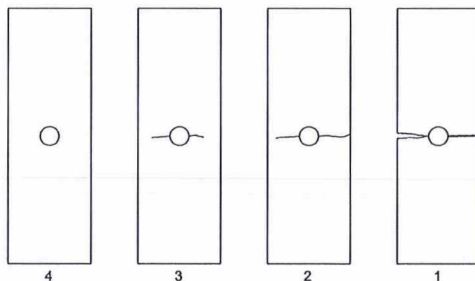
Determined impact strength with a large ball in mm drop height					
Single value					Mean value
1200	1400	1450	1350	1300	1350
Indentation diameter at drop height in mm					
9	8	8	8	8	8

4.10 Resistance against to crazing

Visual examination			
Test specimen 1	Test specimen 2	Test specimen 3	Result (lowest value of the 3 test specimens)
5	5	5	5

Rating scale

- Rating 5: No evidence of cracking.
- Rating 4: Hairline cracks only visible under x 6 magnification.
- Rating 3: Cracks visible with normal vision (corrected if necessary) from the edge of the hole, but not extending to either edge of the specimen.
- Rating 2: A crack visible with normal vision (corrected if necessary) from the edge of the hole, extending to one edge of the specimen such that the specimen is not broken into two pieces.
- Rating 1: Specimen broken into two pieces.



(hairline cracks only visible under 6x magnification)

4.11 Resistance to scratching

Interrupted scratches, faint polishing marks or no visible traces	Scratching load leading to double rings with $\geq 90\%$ closeness	Scratch resistance according to EN 438-2 2016-02, Table 6, as rating number
2 N	4 N	Grade 3

Rating scale according to EN 438-2:2016-02 table 6

Rating scale	Interrupted scratches, faint polishing marks or no visible traces	Scratching load leading to double rings with $\geq 90\%$ closeness
Grade 5	6 N	> 6 N
Grade 4	4 N	6 N
Grade 3	2 N	4 N
Grade 2	1 N	2 N
Grade 1	-	1 N

4.12 Resistance to staining

Visual examination with covering in rating				
Acetone	Coffee	Sodium hydroxide (NaOH)	Hydrogen peroxide (H ₂ O ₂)	Carbon black shoe suspension in paraffin oil (shoe polish simulant)
Group 1	Group 2	Group 3		
16 h	16 h	10 min	10 min	10 min
Grade 5	Grade 5	Grade 5	Grade 5	Grade 5

Rating scale according to EN 438-2:2016-02, Table 8 (comparison of the tested area with the surrounding area)

- Grade 5 *No change*
test area indistinguishable from adjacent surrounding area
- Grade 4 *Slight change (Minor change)*
test area distinguishable from adjacent surrounding area, only when the light source is mirrored on the test surface and is reflected towards the observer's eye, e.g. discoloration, change in gloss and colour
- Grade 3 *Moderate change*
test area distinguishable from adjacent surrounding area, visible in several viewing directions, e.g. discoloration, change in gloss and colour, no change in the surface structure, e.g. deformation, cracking, blistering
- Grade 2 *Significant change*
test area clearly distinguishable from adjacent surrounding area, visible in all viewing directions, e.g. discoloration, change in gloss and colour and/or the structure of the surface slightly changed, e.g. slight cracking, slight blistering
- Grade 1 *Strong change*
The structure of the surface being distinctly changed e.g. strong cracking, strong blistering and/or discoloration, change in gloss and colour and/or the surface material being totally or partially delaminated

5 Evaluation

The tested variant of a HPL can be evaluated for the several properties according to EN 438-3:2016-02, Table 5 (General requirements):

Grey marking: Requirements for the property

Property	Results	Assessment* regarding Requirements in accordance with according to EN 438-3:2016-02, Tables 4 and 5		
		Laminate		
		HDS HDF HDP	HGS HGF HGP	VGS VGF VGP
		444	333	222
Determination of thickness (EN 438-2:2016-02, p. 5)	thickness: 0,86 mm	No requirement		
	Deviation in thickness	≤ 0,10 mm		
	deviation: 0,03 mm	fulfilled		
Resistance to surface wear (EN 438-2:2016-02, p. 10)	revolutions until IP	≥ 350	≥ 150	≥ 50
	460	fulfilled	fulfilled	fulfilled
Resistance to immersion in boiling water (EN 438-2:2016-02, p. 12)	Appearance gloss finish other finishes	≥ Grade 3 ≥ Grade 4	≥ Grade 3 ≥ Grade 4	≥ Grade 3 ≥ Grade 4
	Grade 5	fulfilled	fulfilled	fulfilled
Resistance to water vapour (EN 438-2:2016-02, p. 13)	0,1 mm	No requirement		
Resistance to water vapour (EN 438-2:2016-02, p. 14)	Appearance gloss finish / other finishes	≥ Grade 3 ≥ Grade 4	≥ Grade 3 ≥ Grade 4	≥ Grade 3 ≥ Grade 4
	Grade 5	fulfilled	fulfilled	fulfilled
Resistance to dry heat (160 °C) (EN 438-2:2016-02, p. 16)	Appearance gloss finish / other finishes	≥ Grade 3 ≥ Grade 4	≥ Grade 3 ≥ Grade 4	≥ Grade 3 ≥ Grade 4
	Grade 4	fulfilled	fulfilled	fulfilled
Dimensional stability at elevated temperature (EN 438-2:2016-02, p. 17)	cumulative dimensional change longitudinal L: % (max) transversal T: % (max)	0,45 0,90	0,55 1,05	0,75 1,25
	L: 0,45	fulfilled	fulfilled	fulfilled
	T: 0,80	fulfilled	fulfilled	fulfilled
Resistance to impact with a small diameter ball (EN 438-2:2016-02, p.20)	Spring force [N]	≥ 25	≥ 20	≥ 15
	27	fulfilled	fulfilled	fulfilled
Resistance to impact with a large diameter ball	Drop height [mm]	≥ 1000	≥ 800	≥ 600
	Indentation diameter [mm]	≤ 10	≤ 10	≤ 10

Property	Results	Assessment* regarding Requirements in accordance with according to EN 438-3:2016-02, Tables 4 and 5		
		Laminate		
		<i>HDS HDF HDP</i>	<i>HGS HGF HGP</i>	<i>VGS VGF VGP</i>
		444	333	222
(EN 438-2:2016-02, p.21)	1350 8	fulfilled	fulfilled	fulfilled
Susceptibility to cracking (laminate thickness ≤ 2 mm) (EN 438-2:2016-02, p. 23)	<i>Appearance</i>	≥ Grade 4	≥ Grade 4	≥ Grade 4
	Grade 5	fulfilled	fulfilled	fulfilled
Resistance to scratching (EN 438-2:2016-02, p. 25)	<i>Force (min.) smooth surface / structured surface</i>	≥ Grade 3 ≥ Grade 4	≥ Grade 3 ≥ Grade 4	≥ Grade 3 ≥ Grade 4
	Grade 3	fulfilled	fulfilled	fulfilled
Resistance to staining (EN 438-2:2016-02, p. 26)	<i>Appearance Group 1 and 2 Group 3</i>	= Grade 5 ≥ Grade 4	= Grade 5 ≥ Grade 4	= Grade 5 ≥ Grade 4
	Grade 5 Grade 5	fulfilled	fulfilled	fulfilled

* Statements on conformity assessment/classification were made on the basis of the measurement results obtained. Measurement uncertainties were not included in the assessment (ILAC G8 03/2009 "Guidelines on the Reporting of Compliance with Specification" Section 2.7).



Dipl.-Ing. S. Wenk
Engineer in charge