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Fengxin Xiangsheng Bamboo Industry Co., Ltd.

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Dresden, 22 February 2024
70-Em/Pia

Test Report Order No. 2717676

Client: Fengxin Xiangsheng Bamboo Industry Co., Ltd.
Fengtian Economic Development Zone,
Fengxin County, Jiangxi Province, China

Date of order: 12 December 2023

Order: Determination of reaction to fire performance of bamboo deckings
acc. to EN ISO 9239-1 and EN ISO 11925-2
and classification acc. to EN 13501-1,
Brinell hardness acc. to EN 1534 and Bending strength acc. to EN 408

Contractor: EPH – Laboratory Surface Testing

Engineer in charge: Dipl.-Ing. (BA) R. Piatkowiak



Dr.-Ing. Rico Emmler

Head of Laboratory Surface Testing

The test report contains 5 pages and 1 annex with 24 pages. Any duplication, even in part, requires written permission of EPH. These test results are exclusively related to the tested material.

1 Task

The authorized laboratory Entwicklungs- und Prueflabor Holztechnologie GmbH (EPH) was commissioned by Fengxin Xiangsheng Bamboo Industry Co., Ltd. to carry out tests on bamboo decking according to EN ISO 9239-1, EN ISO 11925-2, EN 1534 and EN 408.

2 Material

For the tests, the client has sent following variant of bamboo decking (entrance at the EPH laboratory 29 January 2024):

Bamboo decking deep carbonized, thickness: 20 mm
2 applicable surfaces (top/bottom side) flat (Var. 1) and grooved (Var. 2)

3 Test performance

3.1 Reaction to fire performance according to DIN EN 13501-1:2010

The test procedures were carried out at the Entwicklungs- und Prueflabor Holztechnologie GmbH (EPH) in Dresden in accordance with the following in DIN EN 13501-1:2010 for floor coverings issued reaction to fire tests:

DIN EN ISO 11925-2: Reaction to fire test – Ignitability of products subjected to direct impingement of flame – Part 2: Single-flame source test;

DIN EN ISO 9239-1: Reaction to fire tests for floorings – Part 1: Determination of the burning behaviour using a radiant heat source.

The product was tested without backing substrate according to DIN EN 13238:2010, i.e. the results are valid for products used as a horizontal decking board covering installed on mineral or wooden subfloor according to EN 13238:2010, with or without air gaps.

For the bamboo decking collection with equal nominal thickness, described in article 2, specimens with the two alternatively surface variants were tested with reduced number of specimen (1 x lengthwise (L); 1 x crosswise (Q)) for determination of the relevant variant due to the worst case performance. Subsequently the relevant variant was tested completely.

The final classification for the reaction to fire performance of the bamboo decking collect determined according to EN 13501-1:2010 based on the results of both tests.

The test was carried out on 19 February 2024.

3.2 Determination of static indentation (Brinell Hardness) according to EN 1534:2011

The test was carried out according to EN 1534:2011 at 50 measuring points.

A buffed steel sphere ($D = 10$ mm, diameter) was impressed into the surface of test specimens with a force F of 1000 N within 15 seconds. After 25 seconds of load holding, the sphere was got off. After 3 minutes waiting, the diameter (d) of impression was measured with a measuring magnifier (0.1 mm scale gradations).

The calculation of the resistance of indentation was carried out according to the following formula:

$$HB = \frac{2 F}{g \pi D (D - \sqrt{D^2 - d^2})} [\text{N/mm}^2]$$

The test was carried out on 21 February 2024.

3.3 Determination of bending strength in four-point bending test according to EN 408:2012

The four-point-bending test was carried out at universal test device Tiratest 28100 on 10 test specimens (one pre-test and 9 tests). The span was 360 mm, the force application points were at 120 mm. The bending strength and the modulus of elasticity was calculated based on the outer dimensions of cross-section. It is not possible to use the calculated mean values for design of construction.

The test was carried out on 20 February 2024.

4 Results

4.1 Reaction to fire performance according to EN 13501-1

The tested bamboo decking attained the following results:

Variant	Testing procedure according to EN 13501-1			Fire class according to EN 13501-1
	Single-flame source test according to DIN EN ISO 11925-2	Burning behaviour using a radiant heat source according to DIN EN ISO 9239-1		
	Requirement max. extent of flame ≤ 150 mm	Critical heat flow in kW/m ²	Integral smoke production in % x min	
1+2	fulfilled	11.02	0.2	B _{fl} -s1

Critical heat flow ≥ 3.0 kW/m² \Rightarrow Fire class D_{fl}

Critical heat flow ≥ 4.5 kW/m² \Rightarrow Fire class C_{fl}

Critical heat flow ≥ 8.0 kW/m² \Rightarrow Fire class B_{fl}

Smoke production ≤ 750 % * min

\Rightarrow Smoke parameter s1

else

\Rightarrow Smoke parameter s2

The corresponding test and classification reports with the detailed results of the tested variants are enclosed in annex 1 of this report.

4.2 Static indentation according to En 1534:2001

Static indentation in N/mm ² (HB) according to EN 1534:2010*		
\bar{x} (n = 50)	s	v
107	19	18 %

* Comparative values:

European Oak: HB = 34 N/mm²

Teak: HB = 28 ... 39 N/mm²

4.3 Determination of bending strength according to EN 408:2012

\bar{x} Test Specimen No.	Bending Properties	
	Bending Strength in N/mm ²	Modulus of Elasticity in Bending in N/mm ²
2	89	17500
3	87	19400
4	84	17300
5	89	18500
6	79	18000
7	97	19600
8	86	19300
9	87	19300
10	85	19700
Mean value	87	18700
Standard Deviation	5	900
COV	6 %	5 %

5 Evaluation

The tested bamboo decking can be classified regarding to several properties as follows:

Variant	Properties	Results	Declaration
1+2	Reaction to fire according to EN ISO 9239-1:2010 and EN ISO 11925-2:2011; Classification according to EN 13501-1:2010 - Critical heat flow - Smoke production	11.02 kW / m ² 0.2 % * min	B _{fl} -s1
2	Static indentation according to EN 1534:2011	107 N/mm ²	
2	Bending strength according to EN 408:2012 (mean value)	87 N/mm ²	
2	Modulus of Elasticity in Bending according to EN 408:2012 (mean value)	18700 N/mm ²	



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