1. Task

The Fraunhofer Institute for Wood Research, Wilhelm-Klauditz-Institut WKI, was entrusted by Messrs. Pacific Ring Europe GmbH in 31691 Seggebruch (Germany) with the determination of formaldehyde emission of a wood-based panel using the chamber test method.

The determination of formaldehyde release should be carried out according to the test methods required by the German Ordinance on bans and restrictive measures for the marketing of hazardous substances, preparations and products according to the Chemicals Act (Chemicals Prohibition Ordinance; Chemikalien-Verbotsverordnung, ChemVerbotsV) as announced by the German Federal Ministry for the Environment in the "Bundesanzeiger" (German Federal Gazette) with date of 26 November 2018. The required test methods are mentioned in table 1 of this test report.

2. Test material

Product:	Plywood, unfaced
Product name:	Albasia Sperrholz, BB/CC
Thickness [mm]:	15
Manufacturer:	BBP, Indonesia
WKI-ID-No.:	0005_2020

The sample material was selected by the customer, marked and sent to the WKI for examination. The test material arrived at WKI packed in polyethylene foil on 8 January 2020, was marked with WKI-ID-No. "0005_2020" and stored under room conditions until the test start on 14 January 2020.

3. Execution of the test

3.1. Test method, conditions and sample preparation

The chamber test was carried out by consideration of DIN EN 16516:2018-01 "Wood-based panels - Construction products - Assessment of release of dangerous substances - Determination of emissions into indoor air" by comprising the test requirements published to comply with the German Chemicals Prohibition Ordinance (ChemVerbotsV).

For the determination of formaldehyde release the samples were placed vertical and approximately in the centre of the closed the chamber, with their surfaces parallel to the direction of the air flow, and separated by not less than 200 mm. The summary of chamber parameter, number of samples and sizes are mentioned in table 2.

Prior to testing the edges were sealed gas-tight with aluminium foil to get a ratio U (unsealed edges) / A (surface area) of 1.5 m/m² and correspond to the large chamber ratio. The edges were sealed air-tight by using self-adhesive aluminium tape.

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3.2. Analytical procedure used for formaldehyde determination - DNPH method

The determination of formaldehyde in the chamber air was carried out in duplicate out after (72 ± 1) hours and on 28th day (± 6h) after loading the chamber according to ISO 16000-3 "Indoor air - Part 3: Determination of formaldehyde and other carbonyl compounds - Active sampling method".

Air sampling was carried out by using gas pump systems and taking out a minimum of 0.06 m³ air out of the test chamber and led it through 2,4-dinitrophenylhydrazine (DNPH) coated cartridges. The analysis was done by using high performance liquid chromatography (HPLC) with ultraviolet/visible (UV/VIS) detection.

4. Test results

For the sample named "Albasia Sperrholz, BB/CC - 15 mm" of Messrs. Pacific Ring Europe GmbH in 31691 Seggebruch (Germany) tested as given in the following formaldehyde releases were determined in the test chamber:

test period		formaldehyde release chamber test in consideration of EN 16516-German ChemVerbotsV ISO 16000-3 (DNPH method)	
analytical procedure		[mg/m³]	[ppm]
72 h	(± 1h)	0.025	0.02
28 d	(± 6h)	**0.019**	**0.02**

The blank value of the chamber before starting the test was determined with ≤ 0.006 mg/m³ resp. 0.005 ppm (1 ppm ≙ 1.24 mg HCHO/m³ air at 23°C and 1013 hPa).

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5. Assessment of test result

According to the German Ordinance on bans and restrictive measures for the marketing of hazardous substances, preparations and products according to the Chemicals Act (Chemicals Prohibition Ordinance; German: Chemikalien-Verbotsverordnung, ChemVerbotsV), Appendix 1 to Section 3, Prohibition on entry into force, "Entry 1: Formaldehyde" Clause 2 (1), coated and uncoated wood-based materials (particleboards, blockboard, veneer boards and fibreboards) shall not be placed on the market if the level of formaldehyde in the air determined as steady-state concentration in chamber caused by the wood-based material exceeds 0.1 ml/cbm (ppm).

Based on the results the tested material complies with the formaldehyde limit value of the German Chemicals Prohibition Ordinance (ChemVerbotsV) with start on January 1, 2020 mentioned below:

Requirement of		Evaluation acc.	ChemVerbotsV [BMU Veröffentlichung Prüfverfahren 2018-11-26] valid from 2020-01-01
limit value fulfilled?	Test method	limit value (test result 28th day)	
Chamber method	DIN EN 16516 German ChemVerbotsV	0.1 ppm formaldehyde	[X] yes [ ] no

We draw your attention to the fact that the effected test was made as a material parameter and not as a classifying test.

K. Huslage

Kathrin Huslage
Official in charge

Accredited Testing Laboratory Wilhelm-Klauditz-Institut WKI Braunschweig in accordance with ISO/IEC 10725

H. Schwab

Dipl.-Ing. Harald Schwab
Head of Testing, Supervision and Certifying Body

Fraunhofer WKI

Table 1: Analytical procedures for sampling and testing announced by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) with regard to formaldehyde for fulfillment of the German Chemicals Prohibition Ordinance (ChemVerbotsV), published on 26 November 2018

Here: »Bekanntmachung analytischer Verfahren für Probenahmen und Untersuchungen für die in Anlage 1 der ChemVerbotsV genannten Stoffe und Stoffgruppen«

Annex 1 (to § 3) ChemVerbotsV	Matrix	Sample preparation	Test method/ procedure
Formaldehyde	coated and uncoated wood-based panels	**Reference method:** Emission testing in a test chamber; average of a double determination of the 28th day as steady-state concentration; air exchange rate 0.5/h, room loading 1.8 m^2/m^3; partly edge sealing: perimeter/area = 1.5 m^{-1} **Additional method:** emission testing in a test chamber; steady-state concentration has to be multiplied by factor 2.0 **Derived test methods:** derived test methods are only suitable for production control. Therefore, a product specific manufacturer correlation has to be established.	**DIN EN 16516** **DIN EN 717-1** e. g. EN ISO 12460-3
		Valid up to 31 December 2019: »Prüfverfahren für Holzwerkstoffe und Produkte aus Holzwerkstoffen« Reference method: emission testing in the test chamber (all plain wood-based panels) Derived method: extraction method ref. to perforator method (only raw particleboards, raw MDF) Derived method: emission testing acc. to gas analysis method (only raw plywood and coated wood-based panels)	 Bundesgesundheitsblatt 34, 10 (1991), S.488-489 DIN EN 717-1 EN ISO 12460-5 EN ISO 12460-3

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Table 2: Chamber parameter for testing wood-based panels regarding formaldehyde release to comply with the German Chemicals Prohibition Ordinance (ChemVerbotsV) by consideration of EN 16516

chamber volume			**0.225**	[m³]
temperature			23 ± 1	[°C]
rel. humidity			50 ± 5	[%]
air exchange	(volume of air flow)		0.5	[h^{-1}]
emission surface area	(without edges)		0.403	[m²]
loading rate	(surface area per chamber volume)		1.8	[m² / m³]
air exchange rate	(air volume per chamber volume)		0.5	[m³ / h / m³]
test pieces	number	dimensions		
	3	length x width/height	280 x 200	[mm]
	1	length x width/height	280 x 120	[mm]
		edges	partly sealed gastight*	

* ref. to EN 717-1: ratio U (unsealed edges) / A (surface area) of 1.5 m/m²