REPORT

Issued by an Accredited Testing Laboratory

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Date	Reference	Page
2024-04-11	O100785-1245872	1 (5)

Idé Flooring Sverige AB
c/o Ideflooring C/O Entreprenörsgat Östra Hamngatan 1
411 10 GÖTEBORG

Emission measurements according to M1

(3 appendices)

Assignment

Emission measurement according to "M1 Emission Classification of Building Materials: Protocol for Chemical and Sensory Testing of Building Materials", ver 15.11.2017, after 28 days of conditioning regarding volatile organic compounds, carcinogenic compounds (EU Regulation No 1272/2008 Annex VI, cat 1A and 1B), formaldehyde, ammonia and sensory acceptability.

Product/test specimen

Table 1.

Product type:	Flooring, click tiles
Product name:	**Futura Comfort**
Manufacturer:	Polynexx, China
Manufacturing date:	2023-10-09
Batch No:	44483
Sampling date:	2024-02-12
Size of sample, packaging:	10 tiles 177 x 1219 mm, in a retail box.
Arrived at RISE:	2024-02-14
Test specimen preparation:	Flooring scenario is used for the testing. Chemical testing: Two tiles were clicked together and two pieces of 13.5 x 43.5 cm were cut out with a joint in the middle. The pieces were placed back-to-back and the cut edges and part of the surface were sealed with aluminium tape, leaving a total exposed surface area of 0.1 m^2. Sensory testing: Two tiles were clicked together and four pieces of 22.5 x 51 cm were cut out with a joint in the middle. The pieces were placed back-to-back and the cut edges and part of the surface were sealed with aluminium tape, leaving a total exposed surface area of 0.43 m^2.
Deviation from protocol:	No
Test period started, date:	2024-02-16
Conditions during ageing:	23 ± 2 °C, 50 ± 5 % RH
Emission samplings, date:	2024-03-15
Place for testing:	Chemistry and Applied Mechanics, Brinellgatan 4, Borås

Methods

The specimens were conditioned outside the testing chambers in separate conditioning containers (with air velocity of ca 0.2 m/s) in a room with controlled climate conditions of 23 ± 2 ºC and 50 ± 5 % RH. The specimens were placed in the chambers four days before the measurements of the chemical emission and three days before the sensory evaluation.

Table 2.
Chamber conditions of the test of chemical emissions

Test chamber volume:	0.27 m^3, stainless steel
Temperature:	23 ± 1 ºC
Relative Humidity:	50 ± 3 % RH
Air exchange rate:	0.5 h^{-1}
Air velocity at specimen surface:	0.1 – 0.3 m/s
Area of sample:	0.1 m^2
Area specific air flow rate:	1.35 m^3/m^2h

Table 3.
Chamber conditions of the test of sensory acceptability

Test chamber volume:	1.0 m^3, stainless steel
Temperature:	23 ± 1 ºC
Relative Humidity:	50 ± 3 % RH
Supply air flow rate:	0.6 l/s = 2.2 m^3/h
Area of sample:	0.43 m^2

Table 4.
Emission sampling and analytical methods

Test	**Sampling method**	**Adsorbent**	**Sampling volume (litre)**	**Analysis method / Quantification**	**Detection limit**
VOC	ISO 16000-9:2006 [1]	Tenax TA	2.7 – 6.2	ISO 16000-6:2021 [2] / FID quantification	1 µg/m^3
Formaldehyde	ISO 16000-9:2006 [1]	DNPH	24 - 33	ISO 16000-3:2022 /HPLC-UV	0.03 µg/sampler
Ammonia	ISO 16000-9:2006 [1]	Treated silica gel	260 - 316	Liquid chromatograph with conductivity detector [3]	0.9 µg/sampler
Sensory evaluation	ISO 16000-28:2012 [4]	--	--	Acceptability, Untrained panel of min 15 persons	--

[1)] In accordance with ISO 16000-9:2006 and M1 protocol.
[2)] In accordance with ISO 16000-6:2021 and M1 protocol.
[3)] The determinations of the sampled silica gel tubes were done by Sahlgrenska Universitetssjukhuset, Miljökemiska laboratoriet, Göteborg, not accredited method
[4)] In accordance with M1 protocol, not accredited method.

Tenax TA and multisorbents were used as adsorption mediums for VOC. The tubes were thermally desorbed and analysed in accordance with ISO 16000-6:2021(Indoor air — Part 6: Determination of organic compounds (VVOC, VOC, SVOC) in indoor and test chamber air by active sampling on sorbent tubes, thermal desorption and gas chromatography using MS or MS FID). This means an analysis in a gas chromatograph and detection with a flame ionisation detector (FID) and mass selective detector (MS). The FID signals are used for compound

quantification. The TVOC is quantified as toluene equivalents. The mass selective detector is used for identification of compounds. The capillary column used is coated with 5% phenyl/ 95 % methylpolysiloxane. Tenax TA and multisorbents were also used as adsorption mediums for testing of volatile carcinogenic compounds, according to EU Regulation No 1272/2008 Annex VI, cat 1A and 1B), (exclusive formaldehyde), 0.001 mg/m^3 and above.

The sampling of formaldehyde was carried out with DNPH samplers. The samplers were analysed according to ISO 16000-3:2022 (Indoor air – Part 3: Determination of formaldehyde and other carbonyl compounds in indoor air and test chamber air – Active sampling method), which means analysis on a liquid chromatograph with absorbance detector.

The sampling of ammonium was carried out with silicagel treated adsorbent tubes and analysis on a liquid chromatograph with conductivity detector.
Minimum two subsequent samples were taken for the VOC determination, for the formaldehyde and for the ammonia respectively.

Results

The results relate only to the items tested. Decision rule: When comparing the measured results and requirement level, the average value of the measured results has been compared with the requirement level. No account is taken to the measurement uncertainty.

The results of the chemical testing are expressed as area specific emission rates and as concentrations in a model room. The model room has a base area of 3 m x 4 m and a height of 2.5 m, with an air exchange rate of 0.5 h^{-1}. The wall area is 31.4 m^2, floor/ceiling area is 12 m^2, small area, like a door, is 1.6 m^2 and very small area, like sealant, is 0.2 m^2. Floor area is used for the calculation of the concentrations.

Calculation of the concentration from the emission rate:

$$Conc = \frac{SER_A \times A}{n \times V}$$

Conc = concentration of a VOC in the model room, in µg/m^3
SER_a = area specific emission rate, in µg/m^{2}h
A = area of sample, in m^2
n = air exchange rate, in changes per hour
V = volume of the model room, in m^3

Table 5.
Results of the chemical testing of **Futura Comfort** after 28 days

Compound	**Concentration in model room** mg/m^3	**Emission rate** mg/m^{2}h	**Criteria M1** mg/m^{2}h
TVOC [5]	< 0.005	**< 0.010**	< 0.2
Carcinogens	< 0.001	**< 0.001**	< 0.001
Single VOC (µg/m^3)	< EU-LCI	--	≤ EU-LCI
Formaldehyde	0.002	**0.003**	< 0.05
Ammonia [6]	< 0.003	**< 0.004**	< 0.03

[5] The TVOC is the sum of the individual concentration ≥ 5 µg/m^3 in model room.
[6] Not accredited method. Test report from Sahlgrenska Universitetssjukhuset: test report 24_7 dated 2024-04-09

Table 6.
Results of the sensory acceptability evaluation of **Futura Comfort**, after 28 days

Evaluator	Sensory evaluation	Criteria M1
1	0.15	
2	0.52	
3	0.55	
4	1.00	
5	0.14	
6	0.78	
7	0.30	
8	0.93	
9	0.52	
10	0.86	
11	0.40	
12	0.87	
13	-0.04	
14	0.02	
15	0.80	
Arithmetic mean of acceptability [7]	**0.52**	≥ + 0.0
Standard deviation	0.35	
90 % confidence interval of arithmetic mean	0.15	≤ 0.2

[7)] Not accredited method.

The empty sensory test chamber acceptability was determined 2024-03-12. The mean acceptability vote of the empty chamber was ≥ 0.8.

Interpretation of the results

The tested product **Futura Comfort** complies with all the requirements of M1 for the tested parameters.

Detailed results

Table 7.
Detailed results (emission rates) of the chemical testing after 28 days

Sample	TVOC (mg/m^2h) as toluene equivalents between C_6-C_{16}	Formaldehyde (mg/m^2h)	Ammonia (mg/m^2h)	Carcinogens (mg/m^2h) between C_6-C_{16}
1	< 0.010	0.002	< 0.004	< 0.001
2	< 0.010	0.003	< 0.005	< 0.001

Table 8.
Single VOCs above 5 µg/m^3 in the model room

Single VOCs	CAS number	Retention time (min)	ID [8]	Emission rate (µg/m^{2}h)	Concentration (µg/m^3)
Single VOCs C_6-C_{16}:		6.2 - 38			
No single VOC detected	--	26.3	B	< 2	< 5
TVOC	--	6.2 - 38	B	< 10	< 5
Volatile Carcinogens [9]		6.2 - 38			
No substances detected	--	--	B	< 1	< 1
Single VOC outside C_6 – C_{16}:					
VVOC (< C_6) [10]		5.0 – 6.2			
No single VVOC detected	--	--	B	< 2	< 5
SVOC (C_{16} – C_{22}) [11]		38 - 51			
No single SVOC detected	--	--	B	< 2	< 5

8) ID: A = quantified compound specific, B = quantified as toluene equivalent
9) Volatile carcinogens = VOCs according to EU Regulation No 1272/2008 Annex VI, cat 1A and 1B
10) VVOC = very volatile organic compounds, as defined in ISO 16000-6
11) SVOC = semi-volatile organic compounds, as defined in ISO 16000-6

TVOC expressed in µg/m^{2}h and µg/m^3 is the sum of all individual substances with concentrations ≥ 5 µg/m^3 (in toluene equivalents).

Level of identification of compounds is 100 % for all compounds ≥ 5 µg/m^3.

There were no compounds quantified and no EU-LCI-values were calculated.

Measurements uncertainty

The expanded measurement uncertainty of VOC result is 25 % (rel) and formaldehyde is 36 % (rel). For ammonia the measurement uncertainty is estimated to 14 % (rel).

See Appendix 1 for a gas chromatogram from the VOC determination and Appendix 2 for a photo of the test specimen. Appendix 3 is the Sampling report received from the customer.

RISE Research Institutes of Sweden AB
Chemistry and Applied Mechanics - Chemical Product Safety

Performed by

Ulrika Johansson

Examined by

Fredrik Solhage

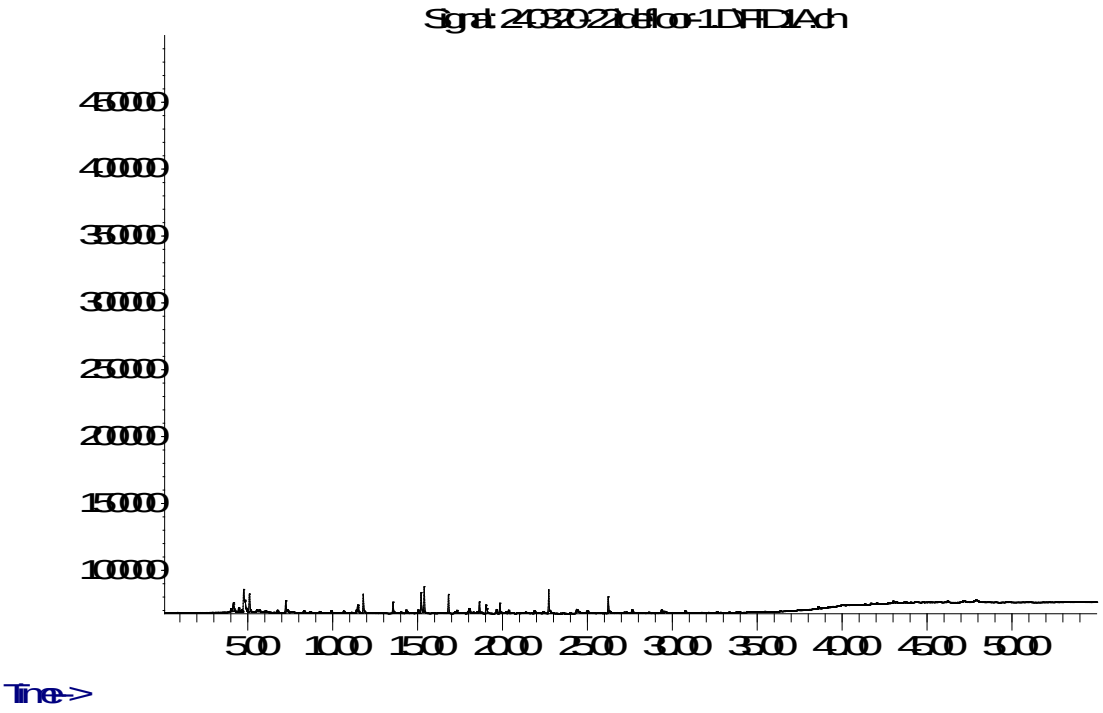
Appendices

1. Gas Chromatogram
2. Photo of test specimen
3. Sampling report

Appendix 1

Gas chromatogram

Sample: **Futura Comfort**, after 28 days



TVOC between C_6 and C_{16}, means compounds eluting between 6.2 and 38 minutes.

Appendix 2

Photo of test specimen

The test specimens of the sensory evaluation.

Appendix 3

Sampling Report

Sampler (Name, Company, contact info): ROBERT JOHNSON 0733158100 IDB FLOORING SWEDEN AB C/O ENTREPRENÖRSG. ÖSTRA HAMNGATAN 1 411 10 GÖTEBORG	**Manufacturer of the product** (Company, address): POLYNEXX XIN COU TOWN, FUNING COUNTY JIANGSU PROVINCA P.R CHINA
Name of product: FUTURE COMFORT	**Type of product:** PVC FREE, BIOBASED LUXE FLOOR
Manufacturing Date: 2023-10-9	**Batch No:** 44483
Date of sampling: 2023-02-12	**Amount/size of material sampled:** 2,14 m² 177 x 1219 mm **Packing material:** PAPPER
Sample is taken from: Production line ☐ Stock / Storage ☒ Miscellaneous ☐ -where, specify:	**How was the product stored before sampling?** DIRECT FROM CONTAINER OCEAN FREIGHT.
If a sub-sample was collected from a larger material amount, describe how the sub-sample was taken: IF U THE BOX WAS TAKEN FROM A PALLET TOTALLY DRIVET IN TOTE CONTAINER 2400 m²	
Observations and remarks:	
Confirmation I hereby confirm that the sample was selected, taken and packed in accordance with the instructions.	
Date: 13/2-23	**Signature:**

Verification

Transaction 09222115557514929447

Document

1245872 Idéflooring, Futura Comfort, M1
Main document
8 pages
Initiated on 2024-04-11 09:01:38 CEST (+0200) by Ulrika Johansson (UJ)
Finalised on 2024-04-11 09:06:57 CEST (+0200)

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