REPORT

issued by an Accredited Testing Laboratory

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Date	Reference	Page
2019-07-03	9F015515	1 (5)

Joreds Postformning AB
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Emission measurements after 28 days

(3 appendices)

Object

One sample of a countertop was delivered to RISE by the customer.

Product name:	**Bänkskiva**
Production date:	2019-04-25
Size of sample:	0.40 x 0.40 m, thickness 29 mm two pieces, wrapped in plastic foil
Date of sampling:	2019-04-26
Date of arrival to RISE:	2019-04-29
Date of analysis:	week 18 – 24, 2019

Assignment

Emission measurement according to ISO 16000-9:2006 (Indoor air – Part 9: Determination of the emission of volatile organic compounds from building products and furnishing – Emission test chamber method), after 28 days regarding volatile organic compounds (VOC and VVOC/SVOC), carcinogenic substances (VOC-substances, EU Regulation No 1272/2008 Annex VI, cat 1A and 1B), formaldehyde and acetaldehyde (ISO 16000-3:2011). Evaluation according to EN 16516:2017 (EU-LCI values).

Method

The test was started 2019-04-30 by unwrapping the test pieces. The two specimens were used for the test, one cut edge per specimen was sealed with aluminium tape. The specimens were placed in a separate conditioning container (with air velocity of ca 0.2 m/s) in a room with controlled climate conditions of 23 ± 2 °C and 50 ± 5 % RH. The test specimens were placed into the chamber four days prior to air samplings. Air samplings after 28 days of conditioning were carried out on 2019-05-28.

Test conditions in the chamber:

Chamber volume:	1.0 m^3
Temperature:	23 ± 0.5 °C
Relative humidity:	50 ± 5 % RH
Surface area of test specimen:	0.32 m^2
Air exchange rate:	0.5 h^{-1}
Area specific air flow rate:	1.6 m^3/m^2 h.
Air velocity at specimen surface:	0.1 – 0.3 m/s

Accred. No. 1002
Testing
ISO/IEC 17025

Tenax TA was used as adsorption medium for VOC. The tubes were thermally desorbed and analysed in accordance to RISE method 0601, similar to ISO 16000-6:2011 (Determination of volatile organic compounds in indoor and test chamber air by active sampling on Tenax TA sorbent, thermal desorption and gas chromatography using MS/FID). This means an analysis in a gas chromatograph and detection with a flame ionisation detector (FID) and mass selective detector (MS). The capillary column used is coated with 5% phenyl/ 95 % methylpolysiloxane. The FID signals are used for compound quantification. The total volatile organic compounds (TVOC) means compounds eluting between and including n-hexane to hexadecane, having boiling points in the range of about 70-260 °C. Minimum duplicate air samples were taken and the results are mean values. Sampled volumes are 3 to 6 L.

Tenax TA was also used as adsorption medium for testing of volatile carcinogenic compounds according to EU Regulation No 1272/2008 Annex VI, cat 1A and 1B), (exclusive formaldehyde), 1 µg/m^3 and above.

The samplings of aldehydes were carried out with DNPH samplers. The samplers were analysed according to RISE method 2302, similar to ISO 16000-3:2011(Indoor air - Part 3: Determination of formaldehyde and other carbonyl compounds – Active sampling method). This means analysis on a liquid chromatograph with absorbance detector. Duplicate air samples were taken and the results are mean values. Sampled volumes were 60 L.

Results

The results relate only to the items tested.

The results in Table 1 are expressed as area specific emission rates and as concentrations in a reference room (according to EN 16516:2017). The reference 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 area is 12 m^2, small area, like a door, is 1.6 – 2.0 m^2 and very small area, like sealant, is 0.2 m^2. **Small area** (1.8 m^2 according to M1 test protocol) is used for the calculation of the concentrations.

Calculation of the concentration from the emission rate:

$$C = \frac{E_a \times A}{n \times V}$$

C = concentration of VOC in the reference room, in µg/m^3
E_a = area specific emission rate, in µg/m^{2}h
A = surface area of product in reference room, in m^2
n = air exchange rate, in changes per hour, here 0.5 h^{-1}
V = volume of the reference room, in m^3, here 30 m^3

Table 1.
Emission results of **Bänkskiva** after 28 days

Volatile organic compounds	CAS number	Retention time (min)	ID[1]	Emission rate ($\mu g/m^2h$)	Concentration in reference room ($\mu g/m^3$)	LCI_i ($\mu g/m^3$)	R_i (c_i/LCI_i)
TVOC ($C_6 - C_{16}$)	--	6.9 – 39	B	< 10	< 10	--	--
Volatile Carcinogens [2]		6.9 – 39					
No substances detected	--	--	B	< 1	< 1	--	--
VOC with LCI [3]		6.9 – 39					
α-Pinene	80-56-8	18.2	A	3	< 5	2500	--
∑ **VOC with LCI**	--	--	A	3	< 5	--	
VOC without LCI [4]		6.9 – 39					
No substances detected	--	--	B	< 2	< 5	--	--
∑ **VOC without LCI**	--	--	B	< 2	< 5	--	--
SVOC ($C_{16} - C_{22}$) [5]		39 - 52					
No substances detected	--	--	B	< 2	< 5	--	--
∑ **SVOC**	--	--	B	< 2	< 5	--	--
VVOC (< C_6) [6]		5.4 – 6.9					
Formaldehyde [7]	50-00-0	--	A	13	< 5	100	--
Acetaldehyde [7]	75-07-0	--	A	< 2	< 5	1 200	--
∑ **VVOC**	--	--	A	13	< 5	--	--
R = ∑ C_i / LCI_i [8]	--	--	--	--	--	--	< 0.01

[1)] ID: A = quantified compound specific, B = quantified as toluene-equivalent
[2)] Volatile carcinogens = VOCs according to EU Regulation No 1272/2008 Annex VI, cat 1A and 1B
[3)] VOC with LCI = identified VOC-compound with LCI-value according to EU-LCI, July 2018
[4)] VOC without LCI = VOC-compound without LCI-value or not identified.
[5)] SVOC = semi-volatile organic compounds, as defined in ISO 16000-6 (not part of accreditation)
[6)] VVOC = very volatile organic compounds, as defined in ISO 16000-6 (not part of accreditation)
[7)] VVOC-aldehydes measured with DNPH samplers (ISO 16000-3)
[8)] All VVOC, VOC, SVOC and carcinogens with LCI

Only VOC-compounds with an emission rate higher than 2 $\mu g/m^2h$ are listed in Table 1, carcinogenic compounds ≥ 1 $\mu g/m^2h$. Only the compounds with a concentration in the reference room > 5 $\mu g/m^3$ are evaluated based on LCI (= lowest concentration of interest). TVOC expressed in $\mu g/m^3$ is the sum of all individual substances with concentrations ≥ 5 $\mu g/m^3$ (in toluene equivalents).

Quantification limit for TVOC is 10 $\mu g/m^2h$. Measurement uncertainty for VOC is 15 % (rel) and for formaldehyde 30 % (rel). Background of TVOC in the empty chamber was below 20 $\mu g/m^3$ and is subtracted.

See Appendix 1 for a gas chromatogram (FID spectra) and Appendix 2 for a photo of the test specimens. Appendix 3 is the sampling report received from the customer.

Summary of the test results

The test results are summarized in Table 2.

Table 2.
Summary of the emission results after 28 days of **Bänkskiva**

Compounds	**Emission rate** ($\mu g/m^2h$)	**Concentration in reference room** (small area scenario) ($\mu g/m^3$)
TVOC	< 10	< 10
∑ Carcinogenic VOCs	< 1	< 1
∑ VOC with LCI	< 2	< 5
∑ VOC without LCI	< 2	< 5
∑ VVOC	13	< 5
Formaldehyde	13	< 5
∑ SVOC	< 2	< 5
$R = \sum C_i / LCI_i$	< 0.01	

Evaluation of the test results

Byggvarubedömningen has criteria regarding Emissions to indoor environment. The emissions are to be measured according to a standard method such as ISO 16000-9 after 28 days regarding VOC and formaldehyde. The requirements for the *Recommended class* is that the requirements to one of the following systems are being met: Emicode EC1, Emicode EC1^{PLUS}, Blue Angel, M1 (RTS) or GUT. The results of the tested sample are compared to M1.

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.

Table 3.
The test results of **Bänkskiva** compared to the relevant requirements in M1

Compounds	**Requirement M1** (mg/m^2h)	**Test Results** (mg/m^2h)	**Pass / Fail**
TVOC	< 0.2	**< 0.010**	**PASS**
Formaldehyde	< 0.05	**0.013**	**PASS**
CMR 1A+1B	< 0.001	**< 0.001**	**PASS**
Single VOC ($\mu g/m^3$)	≤ EU-LCI	≤ EU-LCI	**PASS**
Ammonia	< 0.03	not measured	--
Odour	≥ 0.0	not measured	--

The test results are in compliance with the tested requirements of M1 and meet the requirements for the *Recommended class*.

RISE Research Institutes of Sweden AB
Chemistry and Materials - Chemistry

Performed by

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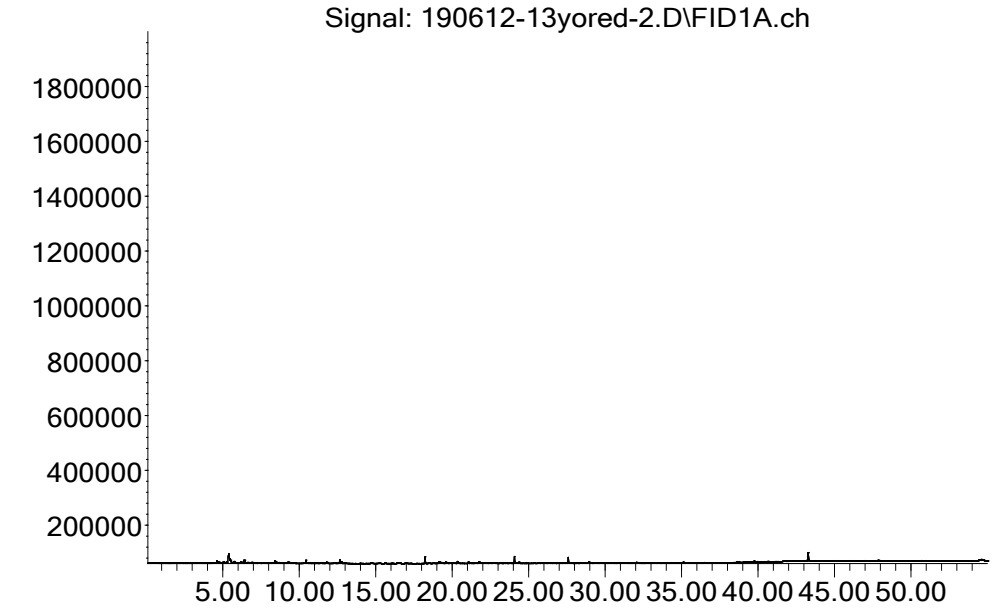
Appendices

1. Gas Chromatogram
2. Photo of the test specimens
3. Sampling report

Appendix 1

Gas chromatogram

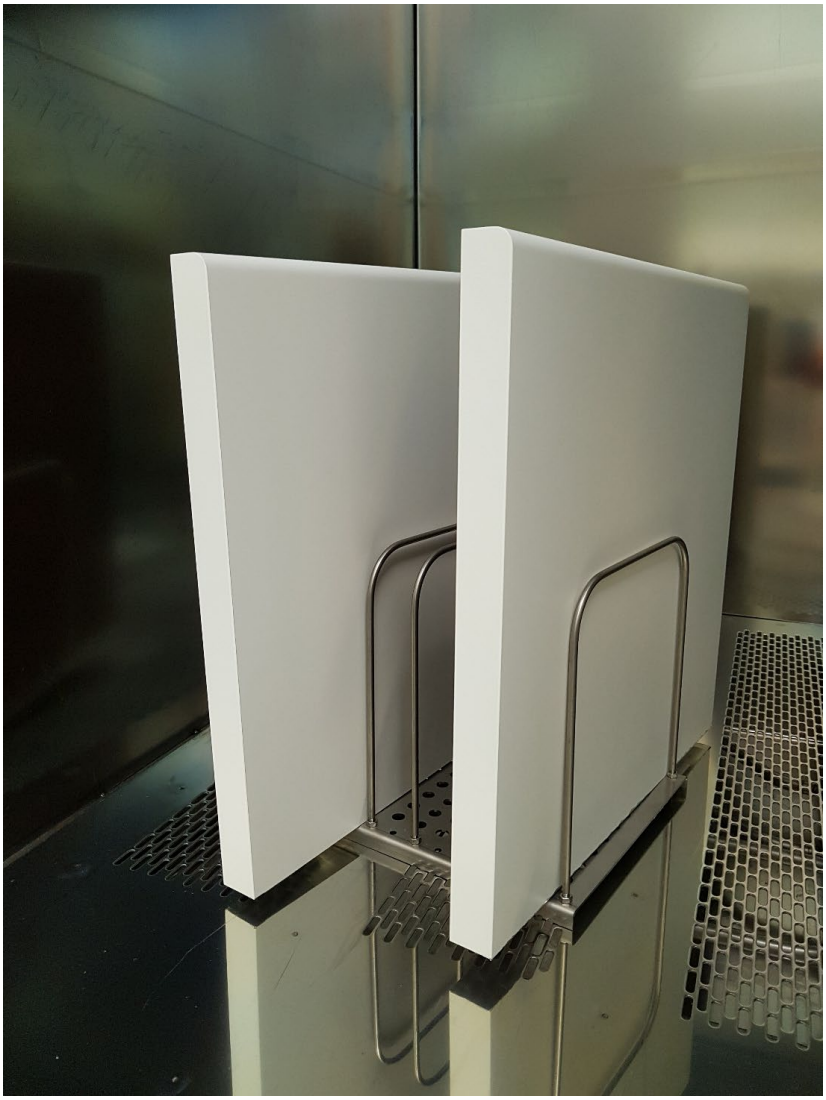
Bänkskiva, after 28 days:



TVOC between C_6 and C_{16}, means compounds eluting between 6.9 and 39 minutes.

Appendix 2

Photo of the test specimen



Appendix 3

Sampling Report

Sampler (Name, Company, contact info): Joreds Postformning AB Daniel Kristiansson 0525-19650 daniel@joreds.se	**Manufacturer of the product** (Company, address): Joreds AB Jored 5 45742 Fjällbacka
Name of product: Bänkskiva	**Type of product:** **Spånskiva. Laminerad på båda sidor.** **Kantlistad med ABS kantlist**
Manufacturing Date: 25/4-19	**Batch No:**
Date of sampling: **26/4-19**	**Amount/size of material sampled:** **2st. 400x400mm** **Packing material: Plast och wellpapp**
Sample is taken from: Production line X Stock / Storage ☐ Miscellaneous ☐ -where, specify:	**How was the product stored before sampling?** Kap material från produktions order
If a sub-sample was collected from a larger material amount, describe how the sub-sample was taken: Kap från en skiva som var 3050x603mm	
Observations and remarks:	
Confirmation I hereby confirm that the sample was selected, taken and packed in accordance with the instructions.	
Date: ~~30/5-19~~ 30/4-19	**Signature:**