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Emission measurements after 28 days

(2 appendices)

Object

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

Product name:	FPS-Gipslim PF3 Colle
Production date:	2021-12-10
Batch:	11:18P0922
Size of sample:	25kg sack
Date of sampling:	2022-08-08
Date of arrival to RISE:	2022-08-09
Date of analysis:	week 33-40

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) and aldehydes (ISO 16000-3:2011). Reference room calculations according to EN 16516:2017/A1:2020 (EU-LCI values).

Method

The test was started 2022-08-17. First the plaster glue was mixed according to instructions. Then it was applied 3 mm thick on a glass plate with a diameter of 150 mm. Applied amount was 92 g.

Open surface area was 0.018 m². The specimen was 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 specimen was placed into the chamber six days prior to air samplings. Air samplings after 28 days of conditioning were carried out on 2022-09-14.

Test conditions in the chamber:

Chamber volume:	0.03 m ³
Temperature:	23 ± 0.5 °C
Relative humidity:	50 ± 3 % RH
Surface area of test specimen:	0.018 m ²

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Accred. No. 1002
Testing
ISO/IEC 17025

Air exchange rate:	0.68 h ⁻¹
Area specific air flow rate:	1.2 m ³ /m ² h
Air velocity at specimen surface:	0.1 – 0.3 m/s

Tenax TA was used as adsorption medium for VOC. The tubes were thermally desorbed and analysed in accordance with 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 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 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 2 to 7 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/m³ and above.

The samplings of aldehydes were carried out with DNPH samplers. The samplers were analysed according 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 21 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/A1, not accredited method). 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 m², floor area is 12 m², small area, like a door, is 1.6 m² and very small area, like sealant, is 0.2 m². Small area 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/m³
 E_a = area specific emission rate, in µg/m²h
 A = surface area of product in reference room, in m²
 n = air exchange rate, in changes per hour, here 0.5 h⁻¹
 V = volume of the reference room, in m³, here 30 m³

Table 1.
Emission results of **FPS-Gipslim PF3 Colle** after 28 days

Volatile organic compounds	CAS number	Retention time (min)	ID ¹	Emission rate (µg/unit h)	Concentration in reference room (µg/m ³)	LCI _i (µg/m ³)	R _i (c _i /LCI _i)
TVOC (C₆ – C₁₆)	--	6.2 – 38	B	< 10	< 1	--	--
Volatile Carcinogens ²		6.2 – 38					
No substances detected	--	--	B	< 1	< 1	--	--
VOC with LCI ³		6.2 – 38					
No substances detected	--	--	B	< 2	< 1	--	--
∑ VOC with LCI	--	--	A	< 2	< 1	--	
VOC without LCI ⁴		6.2 – 38					
No substances detected	--	--	B	< 2	< 1	--	--
∑ VOC without LCI	--	--	B	< 2	< 1	--	--
SVOC (C₁₆ – C₂₂) ⁵		38 - 51					
No substances detected	--	--	B	< 2	< 1	--	--
∑ SVOC	--	--	B	< 2	< 1	--	--
VVOC (< C₆) ⁶		5.2 – 6.2					
Formaldehyde ⁷	50-00-0	--	A	< 2	< 1	100	--
Acetaldehyde ⁷	75-07-0	--	A	< 2	< 1	300	--
∑ VVOC	--	--	A	< 2	< 1	--	
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, Dec 2020

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) R_i is the ratio of c_i/LCI_i, where c_i is the concentration in the reference room for compound *i*.

All VVOC, VOC, SVOC and carcinogens with LCI are included in the calculation of R value.

Only VOC-compounds with an emission rate higher than 2 µg/m²h are listed in Table 1, carcinogenic compounds ≥ 1 µg/m²h. Only the compounds with a concentration in the reference room > 5 µg/m³ are evaluated based on LCI (= lowest concentration of interest). TVOC expressed in µg/m³ is the sum of all individual substances with concentrations ≥ 5 µg/m³ in toluene equivalents.

Quantification limit for TVOC is 10 µg/m²h. Measurement uncertainty for VOC is 15 % (rel) and for formaldehyde 36 % (rel). Background of TVOC in the empty chamber was below 20 µg/m³ and is subtracted.

See Appendix 1 for a gas chromatogram (FID spectra) and Appendix 2 for a photo of the test specimen.

Summary of the test results

The test results are summarized in Table 2.

Table 2.

Summary of the emission results after 28 days of **FPS-Gipslim PF3 Colle**

Compounds	Emission rate ($\mu\text{g}/\text{m}^2\text{h}$)	Concentration in reference room (Small area scenario) ($\mu\text{g}/\text{m}^3$)
TVOC	< 10	< 1
Σ Carcinogenic VOCs	< 1	< 1
Σ VOC with LCI	< 2	< 1
Σ VOC without LCI	< 2	< 1
Σ VVOC	< 2	< 1
Formaldehyde	< 2	< 1
Σ SVOC	< 2	< 1
$R = \Sigma C_i / \text{LCI}_i$	< 0.01	

Evaluation of the test results

The emission results can be compared to different Emission Labelling Systems.

Byggvarubedömningen (version 7.0, 2022-08-14) has criteria regarding Emissions of VOC 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 aldehydes. The requirements for the **Recommended class** are that the test results of TVOC, VOC and aldehydes are in compliance with the requirements of these parameters in one of the following systems: Emicode EC1, Emicode EC1^{PLUS}, Blue Angel, M1 (RTS) or GUT.

The results of the tested sample are compared to **M1** "M1 Emission Classification of Building Materials: Protocol for Chemical and Sensory Testing of Building Materials, ver 15.11.2017", see Table 3.

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 **FPS-Gipslim PF3 Colle** are compared to the relevant requirements in M1

Compounds	Requirement M1 small area (mg/m ³)	Test Results (mg/m ³)	Pass / Fail
TVOC	< 0.02	< 0.001	PASS
Formaldehyde	< 0.01	< 0.001	PASS
CMR 1A+1B	< 0.001	< 0.001	PASS
Single VOC (µg/m ³)	≤ EU-LCI	≤ EU-LCI	PASS
Ammonia	< 0.01	not measured	--
Odour	≥ 0.0	not measured	--

Results of evaluation:

The test results of TVOC, VOC and aldehydes are in compliance with the requirements of M1 after 28 days and meet the requirements of Byggvarubedömningen of the **Recommended class** regarding Emissions of VOC to the indoor environment.

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

Performed by

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Appendices

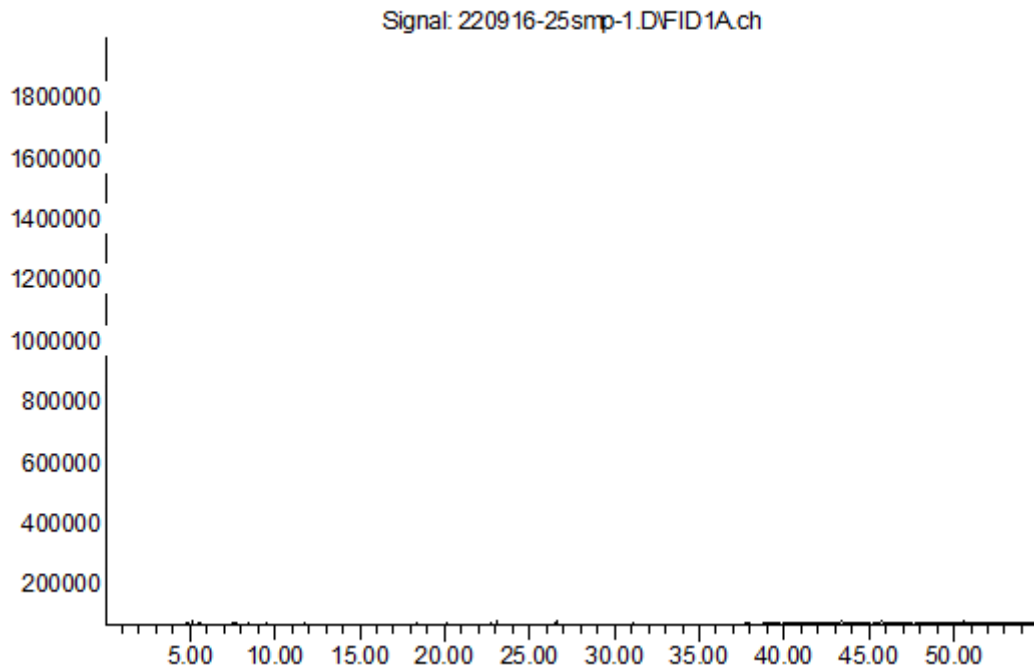
1. Gas Chromatogram
2. Photo of the test specimen

Appendix 1

Gas chromatogram

FPS-Gipslim PF3 Colle, after 28 days:

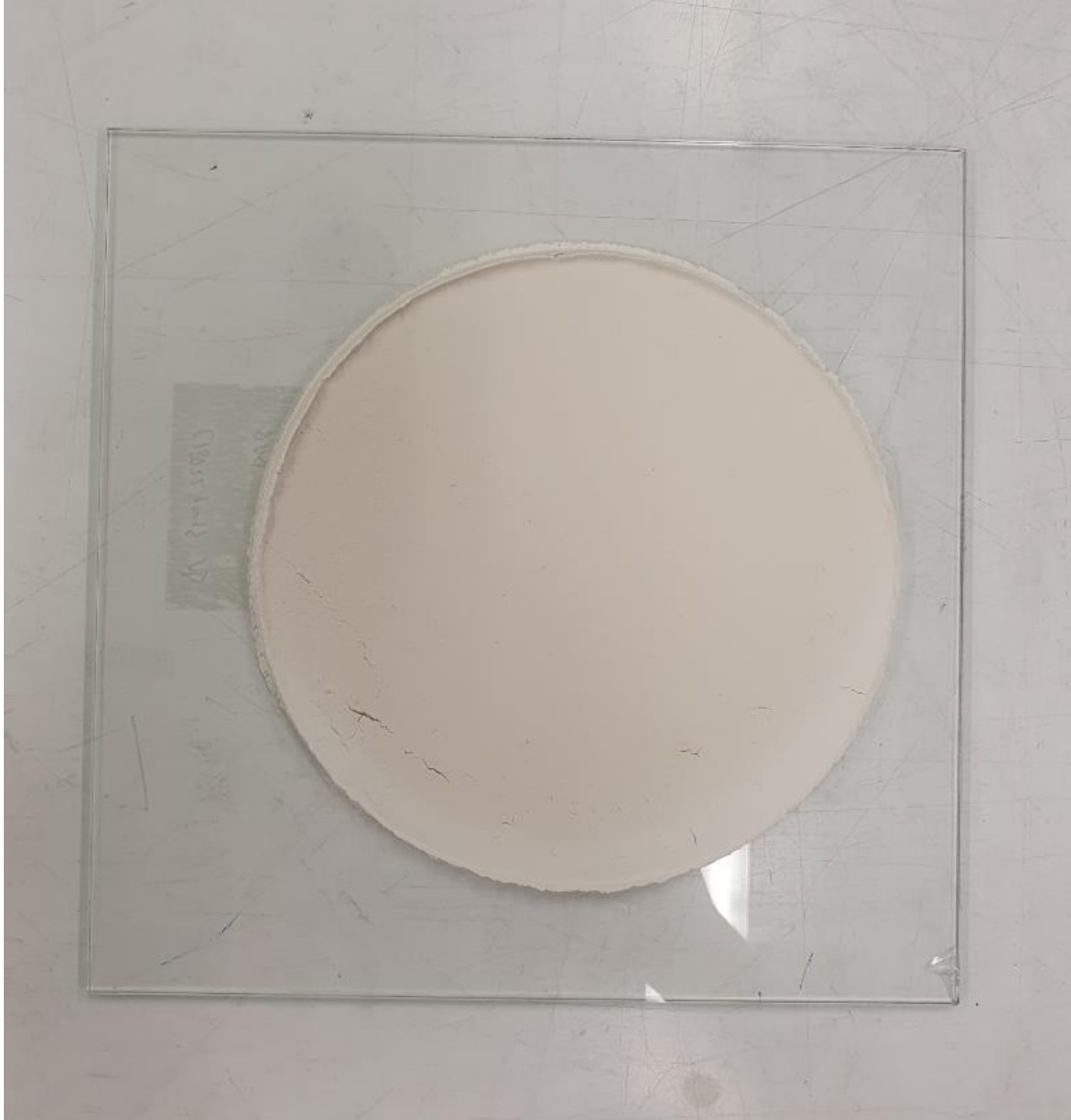
Abundance



Time-->

TVOC between C₆ and C₁₆, means compounds eluting between 6.9 and 39 minutes.

Appendix 2

Photo of the test specimen**FPS-Gipslim PF3 Colle**

Verification

Transaction 09222115557478836859

Document

O100152-1139756

Main document

7 pages

Initiated on 2022-10-07 10:27:01 CEST (+0200) by

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