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SWEDAC ACKREDITERING 1002 ISO/IEC 17025

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Emission measurement according to M1

(3 appendices)

Assignment

At the request of Tikkurila Sverige AB an emission measurement regarding VOC according to "M1 Emission Classification of Building Materials: Protocol for Chemical and Sensory Testing of Building Materials", ver 21.5.2014, has been carried out.

The measurements are made 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

Product type:	Interior paint
Product name:	**Scotte GT 7 vit /bas A**
Batch No:	13022017, 6899609
Manufacturing date:	2014-04-17
Packaging:	Tin can, 1 L
Arrived at SP:	2014-05-07
Test specimen preparation:	The product can be used on walls. Wall scenario is used for the testing. Chemical testing: The paint was applied with a roller on a glass plate of 0.20 x 0.20 m. Applied amount was 8.7 g (= 218 g/m^2 = 6 m^2/L). Sensory testing: Twelve glass plates of 0.25 x 0.57 m were applied with a roller. Mean applied amount per plate was 31 g (= 218 g/m^2 = 6 m^2/L).
Deviation from protocol:	No deviations.
Test period started, date:	2014-05-08 (chemical), 2014-05-22 (sensory)
Conditions during ageing:	23 ± 2 °C, 50 ± 5 % RH
Emission samplings, date:	2014-06-05 (chemical), 2014-06-19 (sensory)

Methods

The specimens were conditioned outside the testing chambers in a controlled climate conditions of 23 ± 2 °C and 50 ± 5 % RH. The specimens were placed in the chambers three (chemical) and two (sensory) days before the measurements.

Chamber conditions of the test of chemical emissions:

Test chamber volume:	0.03 m^3, stainless steel
Temperature:	23 ± 1 °C
Relative Humidity:	50 ± 3 % RH
Air exchange rate:	1.5 h^{-1}
Air velocity at specimen surface:	0.1 – 0.3 m/s
Area of sample:	0.04 m^2
Area specific air flow rate:	1.1 m^3/m^2h

Chamber conditions of the test of sensory acceptability:

Test chamber volume:	1.0 m^3, stainless steel
Temperature:	23 ± 1 °C
Relative Humidity:	50 ± 3 % RH
Supply air flow rate:	0.9 l/s = 3.24 m^3/h
Area of sample:	1.7 m^2

Emission sampling and analytical methods:

Test	**Sampling method**	**Adsorbent**	**Sampling volume (litre)**	**Analysis method / Quantification**	**Detection limit**
VOC	SP 1314[1]	Tenax TA	3 - 12	SP 0601 [2] / FID quantification	1 µg/m^3
Formaldehyde	SP 1314[1]	DNPH	46	SP 2303[3] / HPLC-UV	0.03 µg/sampler
Ammonia	SP 1314[1]	Silica gel	140, 160	Liquid chromatograph with conductivity detector [4]	0.9 µg/sampler
Sensory evaluation	Untrained panel of min 15 persons	--	--	--	--

[1)] In accordance with ISO 16000-9:2006, accredited method.
[2)] In accordance with ISO 16000-6:2011 and M1 protocol, accredited method.
[3)] In accordance with ISO 16000-3:2001, accredited method.
[4)] The determinations of the sampled silica gel tubes were done by Sahlgrenska Universitetssjukhuset, Miljökemiska laboratoriet, Göteborg, not accredited method.

Tenax TA was used as adsorption medium for VOC. The Tenax tubes were thermally desorbed and analysed in accordance to ISO 16000-6:2011 (Determination of volatile organic ompounds in indoor and test chamber air by active sampling on Tenax TA sorbent, thermal desorption and gas chromatography using MS/FID), accredited SP method 0601. 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 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), 0.001 mg/m^3 and above. The compound specific response factors were calculated.

The sampling of formaldehyde was carried out with DNPH samplers. The samplers were analysed according to ISO 16000-3 (in accordance to accredited SP method 2302), 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.

Two subsequent samples were taken for the VOC determination, for the formaldehyde and for the ammonia respectively.

Results

The results of the chemical testing are expressed as concentrations in the model room and as area specific emission rates:

A model room has a volume of 30 m^3 and an air change rate of 0.5 changes per hour. The concentration of VOC in the model room can be calculated according to this equation:

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

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 (31.4 m^2 for walls)
n = air exchange rate, in changes per hour
V = volume of the model room, in m^3

Results of the chemical testing of the sample of **Scotte GT 7 vit /bas A** after 28 days:

Compound	**Concentration in model room** mg/m^3	**Emission rate** mg/m^{2}h	**Criteria M1** mg/m^{2}h
TVOC	0.020	**0.010**	< 0.2
Carcinogens	< 0.002	**< 0.001**	< 0.005
Formaldehyde	0.002	**0.001**	< 0.05
Ammonia	< 0.014	**< 0.007**	< 0.03

Test report from Sahlgrenska Universitetssjukhuset: test report 2014:24 dated 2014-06-24.

See appendix 1 for gas chromatogram from the VOC determination.

Results of the sensory evaluation of the sample of **Scotte GT 7 vit /bas A** after 28 days:

Evaluator	Sensory evaluation	Criteria M1
1	0.95	
2	0.90	
3	0.60	
4	0.10	
5	0.95	
6	0.75	
7	0.90	
8	0.65	≥ + 0.0
9	0.65	
10	0.95	
11	0.90	
12	0.95	
13	0.75	
14	0.70	
15	0.65	
Arithmetic mean of acceptability:	**0.8**	

Standard deviation: 0.22
90 % confidence interval of arithmetic mean: 0.10

The empty sensory test chamber acceptability was determined 2014-06-17. The mean acceptability vote of the empty chamber was > 0.8.

Interpretation of the results

The tested product **Scotte GT 7 vit /bas A** complies with all the requirements of M1 for the tested parameters.

Detailed results

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	0.001	< 0.007	< 0.001
2	0.011	0.001	< 0.006	< 0.001

Single VOCs above 0.005 mg/m^3 in the model room (as toluene equivalents):

Single VOCs	Retention time (min)	CAS number	Concentration (mg/m^3)	
			Sample 1	Sample 2
Single VOCs C_6-C_{16}:	5.5 – 36.8			
Ethanol, 2-phenoxy-	26.7	122-99-6	0.009	0.011
		TVOC:	0.009	0.011
Single VOC outside C_6 – C_{16}:				
VVOC (< C_6) [5]	4.5 – 5.5			
No single VVOC detected	--	--	--	--
SVOC (C_{16} – C_{22}) [6]	36.8 - 42.0			
No single SVOC detected	--	--	--	--

[5] VVOC = very volatile organic compounds, as defined in ISO 16000-6 (not accredited)
[6] SVOC = semi-volatile organic compounds, as defined in ISO 16000-6 (not accredited)

Level of identification of compounds is 100 % for all compounds ≥ 0.005 mg/m^3.

Measurements uncertainty

SER_{TVOC}: ± 15 %, $SER_{Formaldehyde}$: ± 30 %, SER_{NH3}: ± 14 %

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Performed by

Maria Rådemar

Examined by

Anders Lorén

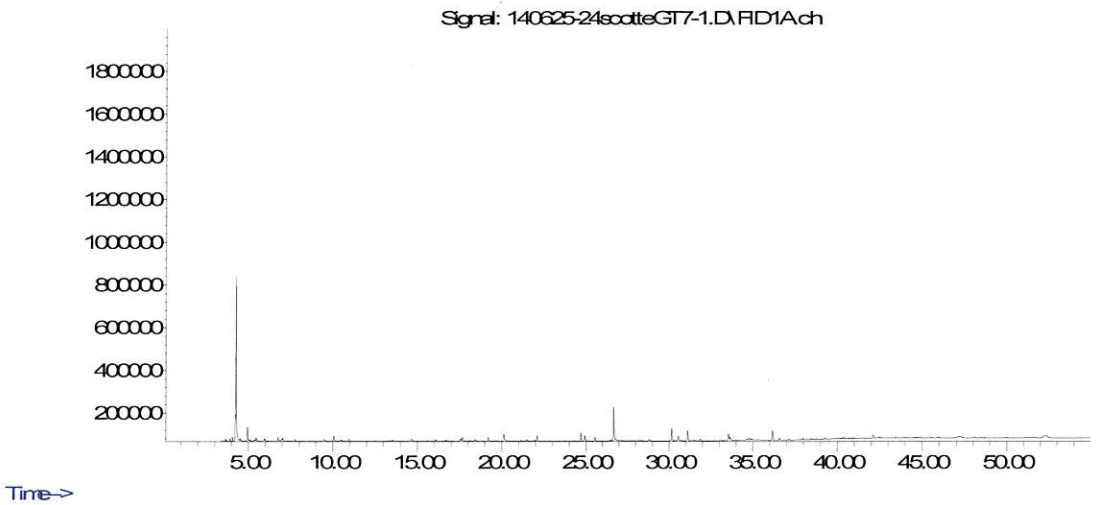
Appendices

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

Appendix 1

Gas chromatogram

Sample: **Scotte GT 7 vit /bas A**, after 28 days (sampled volume: 12 litres):

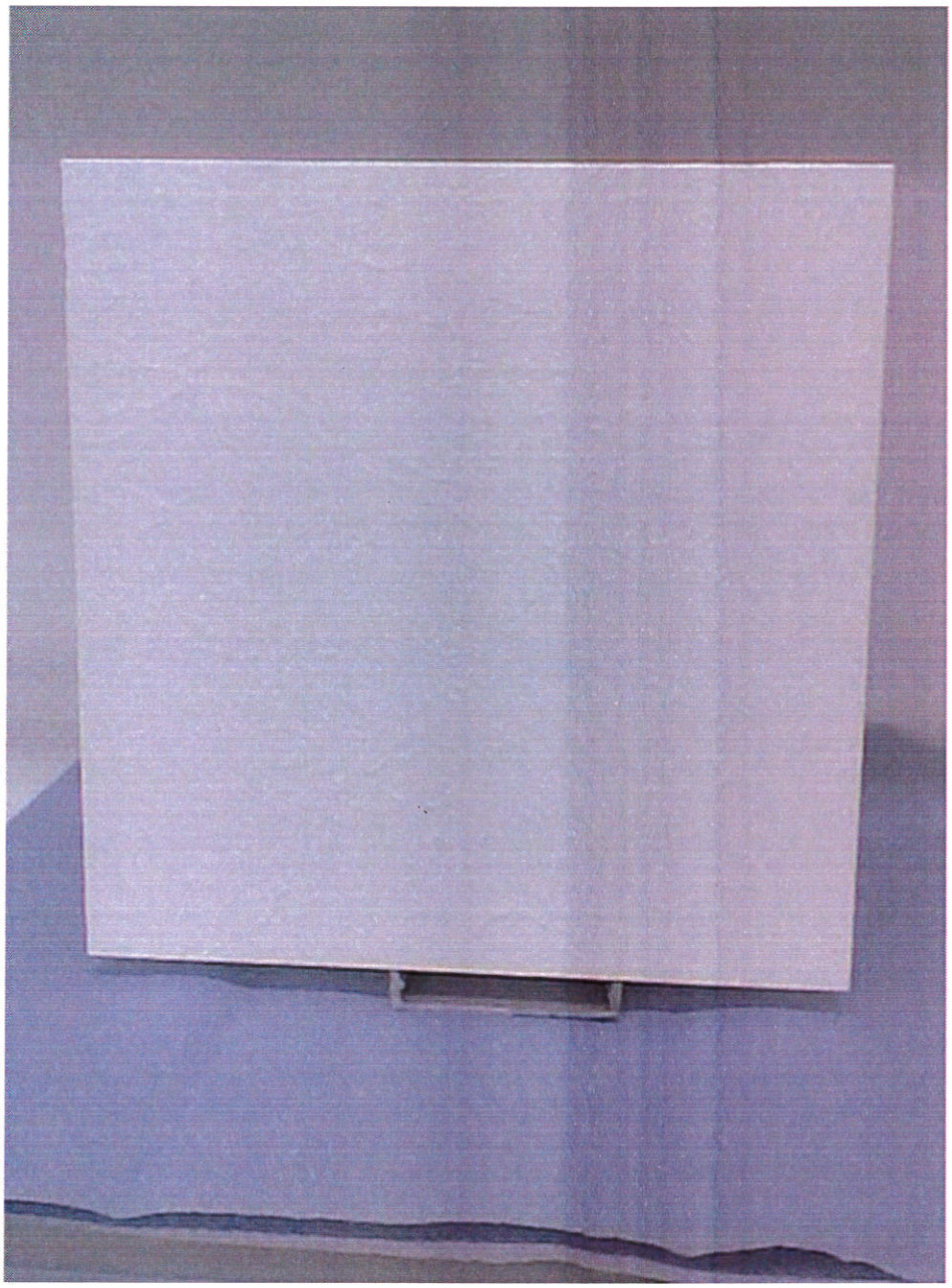


TVOC between C_6 and C_{16}, means compounds eluting between 5.5 and 36.8 minutes.

The compound with retention time 4.3 min is a contamination from the analysis system.

Appendix 2

Photo of test specimen



The specimen for the chemical testing.

4P03540-6
Appendix 3

Sampling Report (paints etc)

Sampler (Name, Company, contact info) Elisabet Wallgren RDI Interior Products Tikkurila Sverige AB elisabet.wallgren@tikkurila.com	**Manufacturer of the product** Tikkurila
Name of product (6) Scotte GT 7 vit/basA	**Product category according to** EN 16402:20113, clause 5: Product category 1
Manufacturing Date 140217	**Batch No** 13022017 6899609
Amount of material sampled 1 liter	
Sample is taken from: Production line ☐ Stock / Storage X Miscellaneous ☐ -where, specify:	**How was the product stored before sampling?** At lab in room temperature
If a sub-sample was collected from a larger material amount, describe how the sub-sample was taken The paint was properly mixed and then poured into a smaller can.	**Packing material:** Tin can
Recommended application amount, solid content, density or other 6-8 m^2/liter $\delta = 1{,}31$ g/cm^3 TH = 39,70 vol-%	
Confirmation I hereby confirm that the sample was selected, taken and packed in accordance with M1 testing protocol	
Date of sampling 2014-05-05	**Signature** Elisabet Wallgren