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EMISSION MEASUREMENTS FOR THE FINNISH CLASSIFICATION OF BUILDING MATERIALS (M1)

1 Sample Information

Sample name	TRUSTONE SPC FLOORING
Batch no.	030919-6
Production date	5.10.2024
Product type	SPC flooring planks
Sample reception	28.10.2024

2 Brief Evaluation of the Results

2.1 Comparison with M1 Limit Values

Parameter	Results	Limit Value, M1	Limit Value, M2
TVOC [mg/(m ² h)]	0.092	≤ 0.2	≤ 0.4
Single VOCs with EU-LCI [mg/m ³]	Complies	≤ EU-LCI	≤ EU-LCI
Formaldehyde [mg/(m ² h)]	0.008	≤ 0.05	≤ 0.125
Ammonia [mg/(m ² h)]	0.008	≤ 0.03	≤ 0.06
Single CMR compounds [mg/m ³]	Complies	≤ 0.001	≤ 0.001
Odour (dimensionless)	+ 0.6	≥ 0.0	≥ 0.0

Full details based on the testing and direct comparison with limit values are available in the following pages.

Espoo, 13.12.2024

Aaro Tuisku
Expert

Distribution Customer

Table of contents

1	Sample Information	1
2	Brief Evaluation of the Results	1
2.1	Comparison with M1 Limit Values	1
3	Applied Test Methods	3
3.1	Specific Laboratory Sampling and Analyses	3
4	Sample Information and Preparation, Test Parameters and Deviations	4
4.1	Sample Information	4
4.2	Preparation of the Test Specimen	4
4.3	Test Period	4
4.4	Emission Test Chamber Parameters during Ageing and Air Sampling	5
4.5	Deviations from Referenced Protocols and Regulations	5
4.6	Picture of Sample	5
5	Results	6
5.1	Emission Test Results after 28 Days	6
5.2	Sensory Testing	7
6	General Test References	8
7	Appendices	9
7.1	Chromatogram	9
7.2	Sampling Report	10
7.3	How to Understand the Results	11
7.4	Description of VOC Emission Test	11

3 Applied Test Methods

3.1 Specific Laboratory Sampling and Analyses

Procedure	External Method	Quantification limit / sampling volume	Analytical principle	Combined Uncertainty [RSD (%)]
Sample preparation	M1 testing protocol /1/	-	-	-
Emission chamber testing	EN 16516 + A1 /2/, ISO 16000-9 /3/	-	Chamber and air control	-
Sampling of VOC	EN 16516 + A1 /2/, ISO 16000-6 /4/	1.5-5 L	Tenax TA	-
Analysis of VOC	EN 16516 + A1 /2/, ISO 16000-6 /4/	1 µg/m ³	TD-GC/MS	±25%
Sampling of very volatile carbonyl compounds*	EN 16516 + A1 /2/, ISO 16000-3 /6/	50-100 L	DNPH cartridge	-
Analysis of very volatile carbonyl compounds*	EN 16516 + A1 /2/, ISO 16000-3 /6/	1 µg/m ³	Liquid chromatography/ UV	±25%
Sampling of Ammonia	EN 16516 + A1 /2, 7/	200-400 L	H ₂ SO ₄ solution	-
Analysis of Ammonia	EN 16516 + A1 /2, 7/ EN 7150-1 /8/	5 µg/m ³	Spectrophotometry	±33%
Odour/sensory testing*	ISO 16000-28 /9/	-	Odour panel, panel size 15	-

*) Not part of T001 accreditation

4 Sample Information and Preparation, Test Parameters and Deviations

4.1 Sample Information

Parameter	Value
Product type	Floor coverings
Product name	TRUSTONE SPC FLOORING
Batch number	030919-6
Production date	5.10.2024
Sampling date	14.10.2024
Sending date	19.10.2024
Sample received	28.10.2024
Packaging / transport	Aluminium foil and plastic wrapping / transportation company
Sample description	SPC flooring planks, thickness 7 mm

4.2 Preparation of the Test Specimen

Two pieces combined, joint 0.24 m (J/A 5.0 m/m²). Reverse side and edges covered with aluminium foil and aluminium tape.

4.3 Test Period

Parameter	Value
Test specimen preparation, date	30.10.2024
Loading of chamber, date	30.10.2024
Emission sampling, date	27.11.2024
Sensory evaluation, date	27.11.2024
VOC analysis, dates	27.11 – 2.12.2024
Formaldehyde analysis, dates	29.11 – 9.12.2024
Ammonia analysis, date	29.11.2024

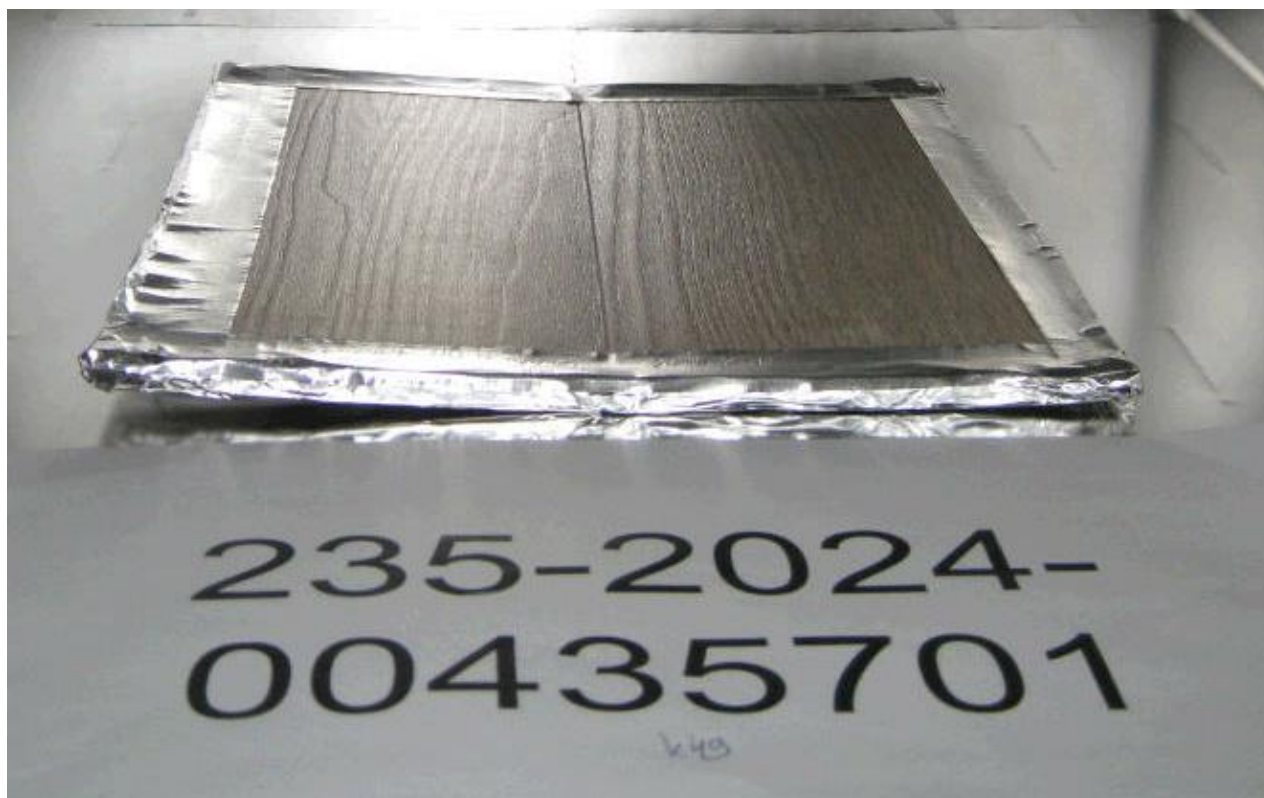
4.4 Emission Test Chamber Parameters during Ageing and Air Sampling

Parameter	Value	Parameter	Value
Chamber volume, V[m ³]	0.12	Test specimen area, [m ²]	0.048
Air Change rate, n[h ⁻¹]	0.5	Area specific ventilation rate, q [m ³ /m ² h]	1.25
Relative humidity of supply air, RH [%]	50 ± 5	Loading factor [m ² /m ³]	0.40
Temperature of supply air, T [°C]	23 ± 1	Test scenario	Flooring

4.5 Deviations from Referenced Protocols and Regulations

No significant deviations from the referenced test methods were observed.

4.6 Picture of Sample



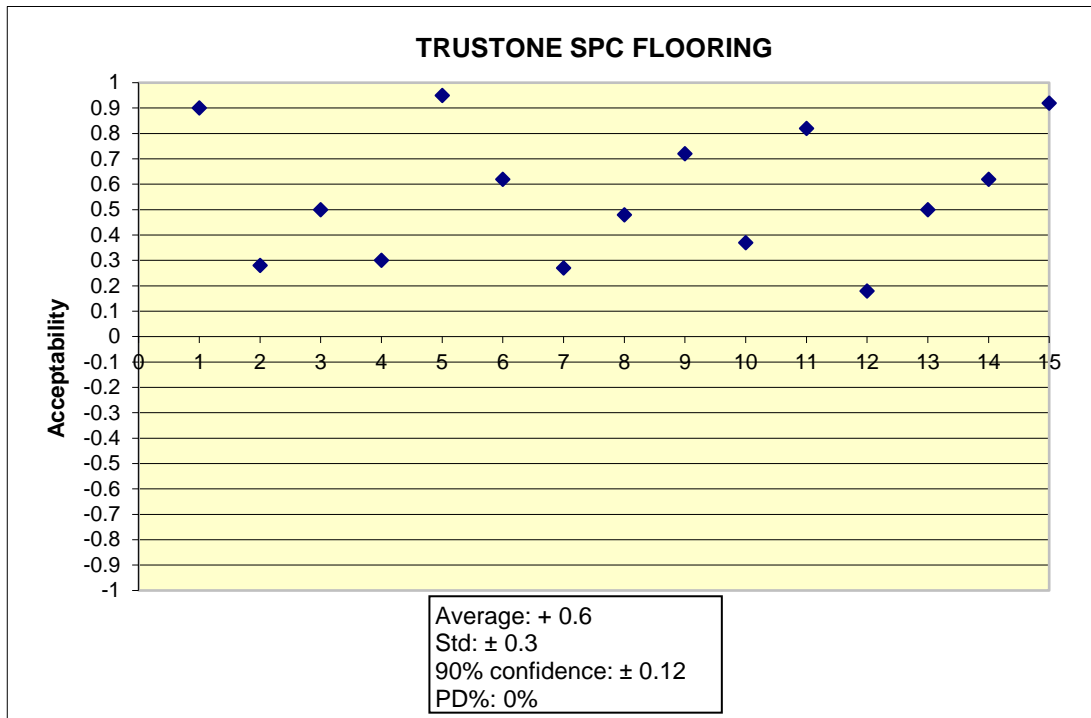
5 Results

5.1 Emission Test Results after 28 Days

Loading factor 0.40 m²/m³ and air change rate 0.5 h⁻¹ used for the calculation of the reference room concentrations.

	CAS No.	Retention time	ID-Cat	Toluene eq.	Toluene SER	Specific Conc.	SER	EU-LCI
		[min]		[µg/m ³]	[µg/(m ² ·h)]	[µg/m ³]	[µg/(m ² ·h)]	[µg/m ³]
VOC compounds								
2,4-Pentanedione	123-54-6	11.94	2	< 5	< 6			
Ethylbenzene	100-41-4	15.09	1	< 5	< 6	< 5	< 6	850
Propyleneglycol monomethyl ether acetate	108-65-6	15.19	1	13	16	26	33	2700
m-Xylene	108-38-3	15.38	1	< 5	< 6	< 5	< 6	500
o-Xylene	95-47-6	16.26	1	< 5	< 6	< 5	< 6	500
Cyclohexanone	108-94-1	16.28	1	< 5	< 6	< 5	< 6	410
Benzaldehyde	100-52-7	18.68	2	30	37			
Unidentified		21.66	4	< 5	< 6			
Acetophenone	98-86-2	22.17	1	< 5	< 6	< 5	< 6	490
Benzoic acid	65-85-0	24.59	2	< 5	< 6			
Dodecane	112-40-3	25.77	1	< 5	< 6	< 5	< 6	6000
2-Phenyl-2-butanol	1565-75-9	27.99	2	< 5	< 6			
2-Hydroxy-2-methylpropiophenone	7473-98-5	28.41	2	31	39			
Tetradecane	629-59-4	30.92	1	< 5	< 6	< 5	< 6	6000
Hexadecane	544-76-3	35.46	1	< 5	< 6	< 5	< 6	6000
TVOC				74	92			
VVOC compounds								
Acetaldehyde	75-07-0					6	7	300
Acetone	67-64-1					25	32	120000
TVVOC				< 5	< 6			
SVOC compounds								
None determined								
TSVOC				< 5	< 6			
CMR substances								
None determined								
Total CMR				< 1	< 1	< 1	< 1	
Formaldehyde	50-00-0		1			6	8	100
Ammonia	7664-41-7		1			6	8	

5.2 Sensory Testing

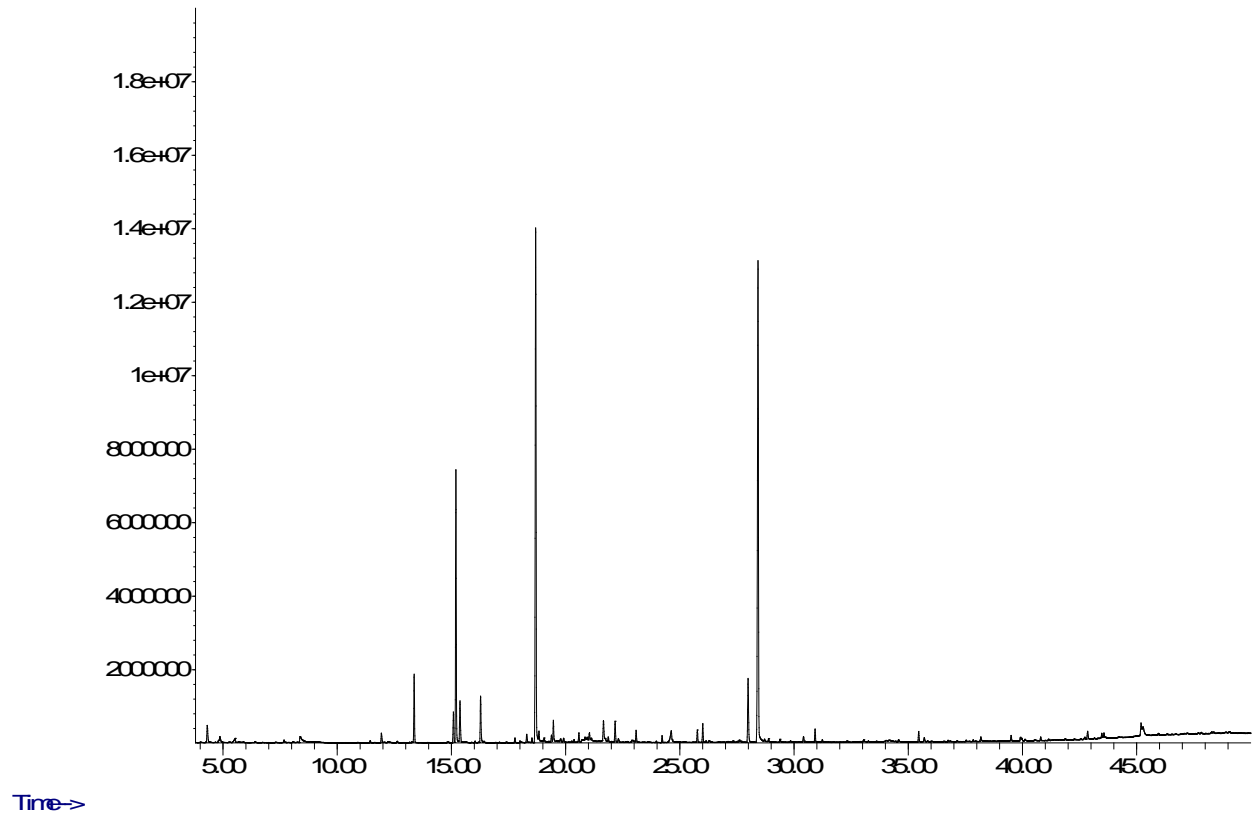


6 General Test References


1. Protocol for Chemical and Sensory Testing of Building Materials. Version 18.6.2024 (<https://cer.rts.fi/en/m1-emission-class-for-building-material/>)
2. EN 16516 + A1 Construction products: Assessment of release of dangerous substances. Determination of emissions into indoor air.
3. ISO 16000-9 Determination of the emission of volatile organic compounds from building products and furnishing. Emission test chamber method.
4. ISO 16000-6 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.
5. EU-LCI VOC-compound emission https://ec.europa.eu/growth/sectors/construction/eu-lci/values_en
6. ISO 16000-3 Determination of formaldehyde and other carbonyl compounds – Active sampling method.
7. In-house method. Determination of ammonium concentration with ammonium cell test based on standards EN 16516 + A1 and ISO 7150-1.
8. ISO 7150-1 Water quality – Determination of ammonium – Part 1: Manual spectrometric method.
9. ISO 16000-28 Determination of odour emissions from building products using test chambers.

7 Appendices

7.1 Chromatogram



7.2 Sampling Report

Sampler (name, company, contact info)	Manufacturer (if deviating from customer)
TRUSTONE - CT STONE INC - Enes YILDIZ	TRUSA MERMER SANAYI VE TICARET LIMITED SIRKETI
Name(s) of the product	Type of the product
TRUSTONE SPC FLOORING	SPC Flooring Planks with 228.6x1219mm in size and 7mm in thickness
Date of manufacturing	Batch number
05/10/2024	030919-6
Date of sampling	Amount of material sampled
14/10/2024	2 planks
The sample is taken from	How was the product stored prior to sampling
Production line <input type="checkbox"/> Stock / storage <input checked="" type="checkbox"/> Miscellaneous, specify <input type="checkbox"/>	Not stored <input type="checkbox"/> Open <input type="checkbox"/> Stacked <input type="checkbox"/> Wrapped up, specify <input checked="" type="checkbox"/>
Date of assembly (office chairs and furniture)	They had been waiting in the box in a pallet for 9 days before sampling
If a sub-sample was collected from a larger material amount, please describe how the sub-sample was taken	
Planks were cut into two before sampling to be able to send by courier. But 4 pieces of 2 planks were prepared as sample.	
Observations and remarks	
The samples were collected from a pallet which will normally go to the warehouse in Canada	
Confirmation	
The signer herewith confirms that the information given in this document is correct and that the sample was selected, sampled, and packed in accordance with current version of the M1 testing protocol.	
Date	Signature
12/12/2024	 CT STONE INC ITH. İTH. İMZA/TIC. LTD. ŞTİ. Tuzluca Mah. Eski SK. Beşiktaş / İstanbul / TÜRKİYE 0212 235 0000

7.3 How to Understand the Results

7.3.1 Acronyms Used in the Report

- * Not a part of FINAS T001 accreditation
 - < Means less than
 - > Means bigger than
 - § Deviation from method. Please see deviation section
 - SER Specific emission rate
- a The method is not optimal for very volatile compounds. For these substances smaller results and a higher measurement uncertainty cannot be ruled out.
 - b The results have been corrected by the emission from untreated product specific substrate. Possible secondary emissions from the substrate cannot be excluded.
 - c Very polar organic compounds are not suitable for reliable quantification using Tenax TA adsorbent and HP-5 GC column. A high degree of uncertainty must be expected.
 - d The component may be underestimated due to exceeding the linear calibration range (contribution from the system) SER Specific Emission Rate.

7.3.2 Explanation of ID Category

Categories of Identity:

- 1: Identified by comparison with a mass spectrum obtained from library and supported by other information and quantified through specific calibration.
- 2: Identified by comparison with a mass spectrum obtained from library and supported by other information. Quantified as toluene equivalent.
- 3: Identified with a lower match by comparison with a mass spectrum obtained from a library. Quantified as toluene equivalent.
- 4: Not identified, quantified as toluene equivalent.

7.4 Description of VOC Emission Test

7.4.1 Test Chamber

The test chamber is made of stainless steel. A multi-step air clean-up is performed before loading the chamber, and a blank check of the empty chamber is performed. The chamber operation parameters are as described in the test method section. /1, 2, 3/

7.4.2 Expression of the Test Results

All test results are calculated as specific emission rate (SER), and as extrapolated air concentration in the European Reference Room. /1, 2/

7.4.3 Testing of VOC, SVOC and VVOC

The emissions of volatile organic compounds including volatile CMR substances (EU Class 1A and 1B, as per European law) are tested by drawing sample air from the test chamber outlet through Tenax TA tubes

after the specified duration of storage in the ventilated test chamber. Analysis is performed by TD-GC/MS using HP-5 column (50 m, 0.2mm ID, 0.33µm film) /2, 4/.

All CMR substances and single substances that are listed with a EU-LCI value in the latest publications /5/ (hereafter referred to as target compounds) are identified if present. All other appearing VOCs are identified as far as possible. Quantification of target compounds is done using the TIC signal and authentic response factors, or the relative response factors relative to toluene. For certain compound groups, which differ significantly in chemistry from toluene, quantification can be performed relative to a representative member of the group for more accurate and precise results. This can include quantification of for example glycols and acids. In addition to that, all results are also expressed in toluene equivalents. All non-target compounds, as well as all non-identified substances, are quantified in toluene equivalents.

The results of the individual substances (CMR substances not included) are calculated in three groups depending on their retention time when analyzing using a non-polar column (HP-5):

- Volatile Organic Compounds (VOC) are defined as: All substances eluting between n-hexane (n-C6) and n-hexadecane (n-C16) including n-hexane, n-hexadecane, acetic acid and 2,2,4-trimethyl-1,3-pentanediol-di-isobutyrate
- Semi-Volatile Organic Compounds (SVOC) are defined as: All substances eluting after n-hexadecane (n-C16) and before and including n-docosane (n-C22)
- Very Volatile Organic Compounds (VVOC) are defined as: All substances eluting before n-hexane (n-C6).

The results of the CMR substances are calculated in their own group.

Total Volatile Organic Compounds (TVOC) is calculated by summation of all individual VOCs between n-hexane and n-hexadecane with a concentration $\geq 5 \mu\text{g}/\text{m}^3$. Compounds regarded as VOC in line with the above definition but elute before n-C6 or after n-C16 on the HP-5 column are treated as VOC, and are thus added to the TVOC.

Total Semi-Volatile Organic Compounds (TSVOC) is calculated by the summation of all individual SVOCs expressed in toluene equivalents with a concentration $\geq 5 \mu\text{g}/\text{m}^3$, as defined in EN 16516. VOCs that are regarded as VOC in line with the above definition, but elute after n-C16 in this test, are not added to the TSVOC.

Total Very Volatile Organic Compounds (TVVOC) is calculated by the summation of all individual VVOCs with a concentration $\geq 5 \mu\text{g}/\text{m}^3$ and expressed in toluene equivalents. VOCs that are regarded as VOC in line with the above definition, but elute before n-C6 in this test, are not added to the TVVOC.

This test only covers substances which can be adsorbed on Tenax TA and can be thermally desorbed. If emissions of substances outside these specifications occur then these substances cannot be detected (or with limited reliability only).

7.4.4 Testing of Formaldehyde and some other very volatile carbonyl compounds

Formaldehyde, acetaldehyde, propionaldehyde, butyraldehyde and acetone were absorbed in dinitrophenyl hydrazine and analysed with liquid chromatography /2, 6/. The limit of quantification is $1 \mu\text{g}/\text{m}^3$.

7.4.5 Testing of Ammonia

Ammonia was absorbed in dilute sulphuric acid and analysed spectrophotometrically with ammonium cell test /2, 7, 8/.

7.4.6 Sensory Testing

An untrained panel of 15 members is performed the sensory evaluation of the product /1, 9/. The panellists evaluate the acceptability of the chamber air in scale clearly unacceptable ... fully acceptable (-1...+1).