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Triple Lite Incorporated
2F,No.78 Fenliao Rd. Section 1 Linkou District
244012 New Tapei City
TAIWAN

Eurofins Expert Services Oy
Kivimiehentie 4
FI-02150 ESPOO
FINLAND

CustomerSupport@eurofins.fi
www.eurofins.fi/expertservices

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

1   Sample Information

Sample name	TRILITE RMS BOARDS – Reinforce Magnesium Silicate
Batch no.	02202023SSA-RMS18
Production date	20.2.2023
Product type	Building board
Sample reception	21.3.2023

2   Brief Evaluation of the Results

2.1   Comparison with M1 Limit Values

Parameter	Area specific emission rate	Limit Value
TVOC [mg/(m²h)]	0.012	≤ 0.2
Single VOCs with EU-LCI [mg/m³]	Complies	≤ EU-LCI
Formaldehyde [mg/(m²h)]	< 0.002	≤ 0.05
Ammonia [mg/(m²h)]	0.002	≤ 0.03
Single CMR compounds [mg/m³]	Complies	≤ 0.001
Odour (dimensionless)	+ 0.7	≥ 0.0

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

Espoo, 9.5.2023

Marja Hemmilä
Expert

Distribution   Customer

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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/m³	TD-GC/MS	±25%
Sampling of formaldehyde*	In-house method /6/, EN 717-1 /7/	200-400 L	H_2SO_4 solution	-
Analysis of formaldehyde*	In-house method /6/, EN 717-1 /7/	5 µg/m³	Spectrophotometry	±23%
Sampling of Ammonia	EN 16516 + A1 /2, 8/	200-400 L	H_2SO_4 solution	-
Analysis of Ammonia	EN 16516 + A1 /2, 8/	5 µg/m³	Spectrophotometry	±33%
Odour/sensory testing*	ISO 16000-28 /9/	-	Odour panel	-

4 Sample Preparation, Test Parameters and Deviations

4.1 Sample Information and Preparation of the Test Specimen

Parameter	Value
Product type	Building board
Product name	TRILITE RMS BOARDS – Reinforce Magnesium Silicate
Batch number	02202023SSA-RMS18
Production date	20.2.2023
Sending date	10.3.2023
Sample received	21.3.2023
Packaging /transport	Aluminium foil-, plastic- and cardboard coverages
Sample description	Light building board
Test specimen preparation	Reversed side and edges were covered
Test period started, date	22.3.2023
Emission sampling, date	19.4.2023
Sensory evaluation, date	19.4.2023

4.2 Emission Chamber Test Parameters

Parameter	Value	Parameter	Value
Chamber volume, V[m³]	0.5	Test period	28 d
Air Change rate, n[h⁻¹]	0.5	Area specific ventilation rate, q [m/h or m³/m²h]	0.50
Relative humidity of supply air, RH [%]	50 ± 5	Loading factor [m²/m³]	1.00
Temperature of supply air, T [°C]	23 ± 1	Test scenario	Wall

4.3 Deviations from Referenced Protocols and Regulations

No significant deviations from the referenced test methods were observed.

4.4   Picture of Sample

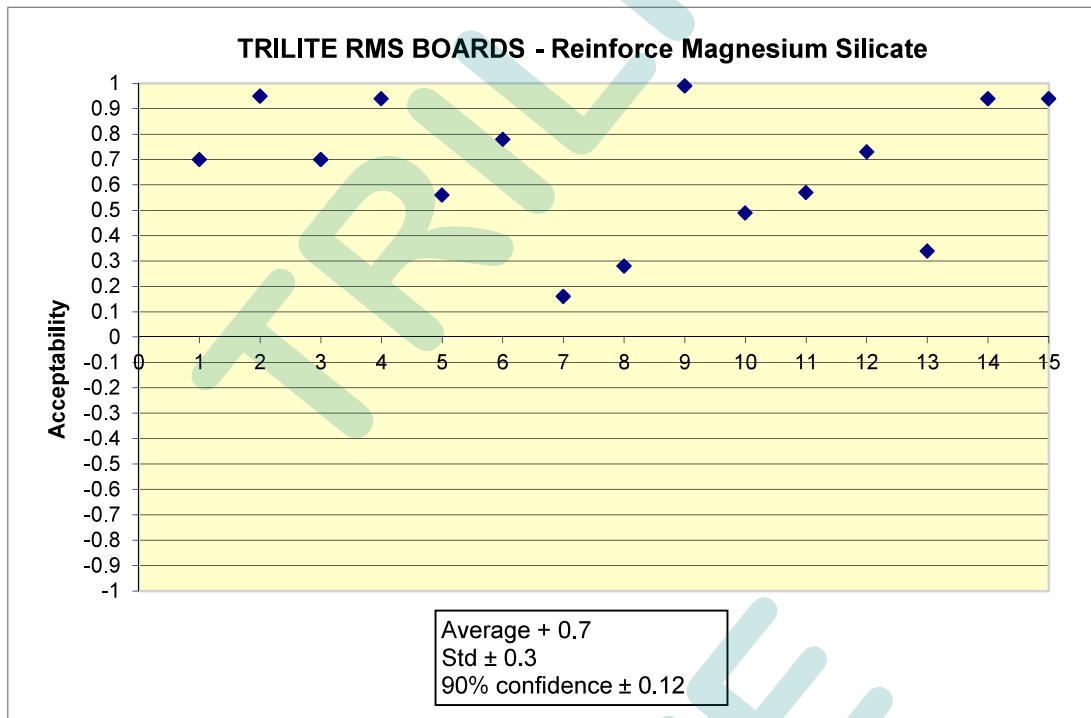The results are only valid for the tested sample(s).
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5 Results

5.1 Emission Test Results after 28 Days

	CAS No.	Reten-tion time	ID-Cat	Toluene eq.	Toluene SER	Specific Conc.	SER	EU-LCI
		[min]		[µg/m³]	[µg/(m²·h)]	[µg/m³]	[µg/(m²·h)]	[µg/m³]
VOC compounds								
Pentanal	110-62-3	8.358	1	< 5	< 2	< 5	< 2	800
2-Pentanone, 4-methyl-	108-10-1	9.928	1	< 5	< 2	< 5	< 2	1000
Hexanal	66-25-1	12.181	1	5	2	8	4	900
α-Pinene	80-56-8	17.322	1	13	6	11	5	2500
Benzaldehyde	100-52-7	18.222	1	8	4	10	5	-
β-Pinene	18172-67-3	18.857	1	< 5	< 2	< 5	< 2	1400
2-Pentylfuran	3777-69-3	19.139	2	< 5	< 2			
Octanal	124-13-0	19.474	1	< 5	< 2	< 5	< 2	900
3-carene	13466-78-9	19.91	1	< 5	< 2	< 5	< 2	1500
m-Cymene	535-77-3	20.339	1	< 5	< 2	< 5	< 2	1000
D-Limonene	5989-27-5	20.486	1	< 5	< 2	< 5	< 2	5000
Eucalyptol	470-82-6	20.627	2	< 5	< 2			
D-Fenchone	4695-62-9	22.48	2	< 5	< 2	< 5	< 2	1400
Nonanal	124-19-6	22.639	1	< 5	< 2	< 5	< 2	900
Fenchol	1632-73-1	23.227	2	< 5	< 2			
Camphor	76-22-2	24.262	2	< 5	< 2	< 5	< 2	1400
2,7-dimethylocta-2,6-dien-1-ol	22410-74-8	24.38	2	< 5	< 2			
Terpinen-4-ol	562-74-3	25.086	2	< 5	< 2			
Linalool	78-70-6	25.315	2	< 5	< 2			
α-Terpineol	10482-56-1	25.409	2	< 5	< 2			
Decanal	112-31-2	25.556	1	< 5	< 2	5	3	900
Copaene	3856-25-5	30.497	2	< 5	< 2	< 5	< 2	1400
β-Elemene	515-13-9	30.78	2	< 5	< 2	< 5	< 2	1400
Longifolene	475-20-7	31.503	2	< 5	< 2	< 5	< 2	1400
Cedr-8-ene	50894-66-1	31.621	2	< 5	< 2			
8-Isopropyl-5-methyl-2-meth-ylene-1,2,3,4,4a,5,6,7-oc-tahydronaphthalene	150320-52-8	31.862	2	< 5	< 2			
TVOC				25	12			
VVOC compounds								
Acetone	67-64-1	4.093	1	7	3	20	10	120000
TVVOC				7	3			
SVOC compounds								
None determined								
TSVOC				< 5	< 2			
CMR substances								
None determined								
Total CMR				< 5	< 2			

	CAS No.	Reten-tion time	ID-Cat	Toluene eq.	Toluene SER	Specific Conc.	SER	EU-LCI
		[min]		[µg/m³]	[µg/(m²·h)]	[µg/m³]	[µg/(m²·h)]	[µg/m³]
Formaldehyde	50-00-0		1			< 5	< 2	100
Ammonia	7664-41-7		1			5	2	

5.2 Sensory Testing

TRILITE RMS BOARDS - Reinforce Magnesium Silicate

Average + 0.7
Std ± 0.3
90% confidence ± 0.12

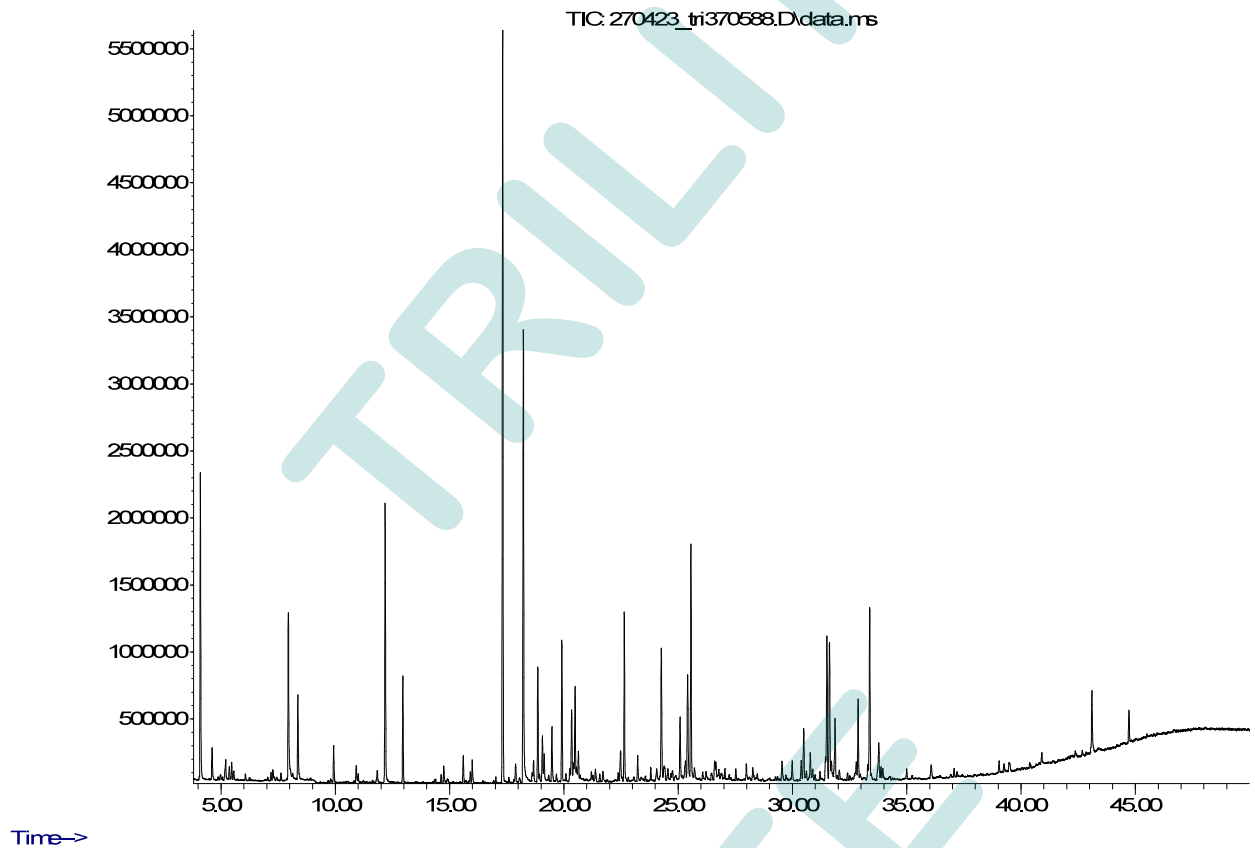# 6   General Test References

1. Protocol for Chemical and Sensory Testing of Building Materials. Version 15.11.2017 (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. EN 717-1. Wood based panels - Determination of formaldehyde release - Part 1: Formaldehyde emission by the chamber method.

7. In-house method. Determination of formaldehyde using spectrometric acetyl acetone -method.

8. In-house method. Determination of ammonium concentration with ammonium cell test.

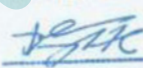9. ISO 16000-28 Determination of odour emissions from building products using test chambers.

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7 Appendices

7.1 Chromatogram

Abundance

TIC: 270423_tri370588.D\data.ms

7.2 Sampling Report

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ORDER FORM

SAMPLING REPORT: M1 TESTING

Customer name / Contact person	Manufacturer (if deviating from customer)
Triple Lite Incorporated	
Name of the product	**Type of the product**
TRILITE RMS BOARDS – Reinforce Magnesium Silicate	BUILDING BOARD
Date of production	**Batch number**
Feb. 20, 2023	02202023SSA-RMS18
Date of sampling	**Amount of material sampled**
March 6, 2023	2 Sheets in 18mm thickness, Size : 800mm x 700mm
The sample is taken from	**How was the product stored prior to sampling**
Production line ☒ Stock / storage ☐ Miscellaneous, specify ☐	The product was taken fresh from production line and was cut from the center of 2 boards, wrapped in airtight aluminium foil, unprinted plastic shrink film..

If a sub-sample was collected from a larger material amount, please describe how the sub-sample was taken

Observations and remarks (date of assembly of office chairs and furniture, etc.)

Confirmation
I hereby confirm that the sample was selected, taken and packed in accordance with M1 testing protocol (version 15.11.2017): https://cer.rts.fi/en/materials-2/

Date	Signature
March 6, 2023	TRIPLE LITE INCORPORATED _signature_ Signature

ilac-MRA **FINAS** Finnish Accreditation Service T001 (EN ISO/IEC 17025)

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

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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 ≥ 5 µg/m³. 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 ≥ 5 µg/m³, 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 ≥ 5 µg/m³ 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 Ammonia
Formaldehyde and ammonia are absorbed in dilute sulphuric acid. Formaldehyde is analysed spectrophotometrically with acetyl acetone method /6, 7/. Ammonia is analysed spectrophotometrically with ammonium cell test /2, 8/.

7.4.5 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).

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