



April 2, 2020

Mr. Walter Lourie
Ambassador
mafi-America, Inc.
300 E. 42nd Street
New York, NY 10017

**Subject: Dynamic Small-Scale Chamber Emissions Testing
 Compliance Report per California Department of Public Health Standard Method
 Version 1.2
 Lye Treated White Oil Larch Flooring
 MAS Project No.: 2000338**

Dear Mr. Lourie:

Materials Analytical Services, LLC is pleased to submit this report with results of VOC emissions testing from an application of Lye Treated White Oil Larch flooring.

MAS conducted this test in accordance with the California Department of Public Health (CDPH) *Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers Version 1.2*. This testing protocol was implemented to bracket similarly formulated, lower emitting products under a single test.

Based on the test results, the Lye Treated White Oil Larch flooring is compliant with the performance standards established for low-emitting materials under the CDPH, the Collaborative for High Performance Schools (CHPS) and the LEED v4.1 programs. Qualified project uses of this product may be eligible for credit points under the CHPS and LEED programs.

MAS is pleased to have been of service to you. If you have any questions or comments, or if we can be of further assistance, please contact us.

Sincerely,

Materials Analytical Services, LLC

Manager, Emissions Group

Senior Analytical Chemist

Appendices: Appendix A – General Testing Parameters and Data
 Appendix B – Chain-of-Custody
 Appendix C – Compliant and Bracketed Products

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Testing Cert. #2925.01

EMISSIONS COMPLIANCE TEST

California Dept. of Public Health Standard Method Version 1.2
Flooring Evaluation

SAMPLE DESCRIPTION & TESTING PARAMETERS

Sample specifics as described in the chain-of-custody (see Appendix B) and a timeline of milestones dates relative to sampling and analysis are summarized below.

Product Name: Lye Treated White Oil Larch	MAS Assigned ID: 2000338
Manufacturer: mafi Naturholzboden GmbH Schneegattern Austria	Product Description: solid wood layers; polyvinyl acetate glue; Approx. 6" x 6" x 1/2"
Manufacture Date: March 9, 2020	Testing Period: March 13 – 27, 2020
Collection Date: March 9, 2020	In-Chamber Sampling Dates: March 24 @ 24 hrs.; March 25 @ 48 hrs.; March 27 @ 96 hrs.
Shipping Date: March 10, 2020	Date of Sample Analysis: March 27 – April 1, 2020
Laboratory Arrival Date: March 12, 2020	Age of Sample at Testing: 4 days



Lye Treated White Oil Larch flooring as submitted

To prepare the sample for chamber testing, the edges and back of the sample were sealed with aluminum tape. The sample was then placed inside one of MAS's small-scale emissions chambers.

Sample conditioning, collection of samples, and analysis of compounds of interest were conducted in accordance with the California Department of Public Health (CDPH) *Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers Version 1.2*, for comparison to the Leadership in Energy and Environmental Design (LEED) standard, and the Collaborative for High Performance Schools (CHPS) criteria for low emitting materials. Appendix A presents general testing parameters and data.



TEST RESULTS

To compare the chamber-derived data to the standards established under CDPH Standard Method and the CHPS criteria an emission factor for the tested sample is calculated based on the 96-hour test point data following ten days of in-chamber conditioning. This emission factor is used to predict airborne concentrations of target compounds in a CDPH-defined classroom with a total floor area of 89.2 square meters, and a typical private office with a total floor area of 11.1 square meters. Table I presents the results of the modeled data.

Table I
Comparison of Emission Factors and Predicted 96-Hour Airborne Concentrations from the Lye Treated White Oil Larch Flooring to CDPH Concentration Limits in Typical Building Environments

VOC Name	Calculated Emission Factor (µg/m ² hr)	Predicted Airborne Concentration (µg/m ³)*		Maximum Concentration Limits (µg/m ³)	Testing Comment
		Classroom	Private Office		
Total VOCs (TVOC)	80	38	43	NA†	NA
Formaldehyde ^{1,2}	<3.2	<1.5	<1.7	9	Compliant
Acetaldehyde ^{1,2}	4.3	2.1	2.3	70	Compliant
Isopropanol	5.3	2.5	2.8	3500	Compliant
1,1-dichloroethylene	<2.9	<1.4	<1.6	35	Compliant
Methylene chloride ²	<2.9	<1.4	<1.6	200	Compliant
Carbon disulfide ^{1,2}	<2.9	<1.4	<1.6	400	Compliant
MTBE ²	<2.9	<1.4	<1.6	4000	Compliant
Vinyl acetate ²	<2.9	<1.4	<1.6	100	Compliant
Hexane ²	<2.9	<1.4	<1.6	3500	Compliant
Chloroform ^{1,2}	<2.9	<1.4	<1.6	150	Compliant
2-methoxyethanol ¹	<2.9	<1.4	<1.6	30	Compliant
1,1,1-trichloroethane ²	<2.9	<1.4	<1.6	500	Compliant
Benzene ^{1,2}	<2.9	<1.4	<1.6#	1.5	Compliant
1-methoxy-2-propanol	<2.9	<1.4	<1.6	3500	Compliant
Carbon tetrachloride ^{1,2}	<2.9	<1.4	<1.6	20	Compliant
Ethylene glycol ²	<2.9	<1.4	<1.6	200	Compliant
1,4-dioxane ^{1,2}	<2.9	<1.4	<1.6	1500	Compliant
Trichloroethylene ^{1,2}	<2.9	<1.4	<1.6	300	Compliant
Epichlorohydrin ^{1,2}	<1.5	<0.72	<0.81	1.5	Compliant
2-ethoxyethanol ¹	<2.9	<1.4	<1.6	35	Compliant
n,n-dimethylformamide ²	<2.9	<1.4	<1.6	40	Compliant
Toluene ^{1,2}	<2.9	<1.4	<1.6	150	Compliant
2-methoxyethanol acetate ¹	<2.9	<1.4	<1.6	45	Compliant
Tetrachloroethylene ^{1,2}	<2.9	<1.4	<1.6	17.5	Compliant
Chlorobenzene ²	<2.9	<1.4	<1.6	500	Compliant
Ethylbenzene ^{1,2}	<2.9	<1.4	<1.6	1000	Compliant
m & p-xylene ²	<2.9	<1.4	<1.6	350	Compliant
Styrene ^{1,2}	13	6.0	6.7	450	Compliant
2-ethoxyethyl acetate ¹	<2.9	<1.4	<1.6	150	Compliant
o-xylene ²	<2.9	<1.4	<1.6	350	Compliant
Phenol ²	<2.9	<1.4	<1.6	100	Compliant
1,4-dichlorobenzene ^{1,2}	<2.9	<1.4	<1.6	400	Compliant



Isophorone ²	<2.9	<1.4	<1.6	1000	Compliant
Naphthalene ^{1,2}	<1.5	<0.72	<0.81	4.5	Compliant

* Assumes a 24' x 40' x 8.5' classroom with a ventilation rate of 0.82 h⁻¹ and a 10' x 12' x 9' private office with a ventilation rate of 0.68 h⁻¹ as defined by CDPH/EHLB/Standard Method V.1.2

† TVOC is not included as a target compound in the CDPH Standard, but is reported as part of the requirements of the Standard.

1 Compound included on Cal/EPA OEHHA Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65) list

2 Compound included on Cal/EPA ARB list of Toxic Air Contaminants (TAC)

No benzene was detected in the sample; however, modeling criteria elevates the predicted concentration above the maximum limit set by CDPH. MAS believes the compound is compliant with CDPH criteria.

CONCLUSIONS

Based on the emissions test data, MAS offers the following findings and conclusions:

- Predicted airborne concentrations of the CDPH target compounds at the 14-day test point in both a classroom and private office setting are compliant with the CDPH Standard Method v1.2 maximum concentration limits.
- By virtue of compliance with the CDPH Standard Method, the Lye Treated White Oil Larch flooring is compliant with the performance standards established for low-emitting materials under the Collaborative for High Performance Schools (CHPS) 2019 Core Criteria EQ C6.1.2 Flooring Systems.
- By virtue of compliance with CDPH Standard Method v1.2, the Lye Treated White Oil Larch flooring is compliant with LEED v4.1 EQ: Low-Emitting Materials VOC emissions evaluation criteria. In accordance with LEED v4 reporting requirements, the estimated TVOC concentrations are 5 mg/m³ or less.

Qualified project uses of the Lye Treated White Oil Larch flooring and all bracketed products (see Appendix C) may be eligible for credit points under the CHPS and LEED programs.

Note: all data, including but not limited to raw instrument files, calibration fits, and quality control checks used to generate the test results are available to the client upon request.

LIMITATIONS

This report is for the exclusive use of Materials Analytical Services, LLC's Client, mafi-America, Inc., and is provided pursuant to the agreement between MAS and its Client. MAS's responsibility and liability are limited to the terms and conditions of the agreement. If other parties wish to rely on this report, please contact MAS so an agreement on the terms and conditions for its use can be established prior to the use of this information. MAS assumes no liability to any party, other than the Client in accordance with the agreement, for any loss, expense or damage caused by the use of this report. This report shall not be reproduced, except in full, without the written approval of Materials Analytical Services, LLC. The observations and test results contained in this report are relevant only to the sample tested and the bracketed products listed. This report by itself does not imply that the materials or products tested or bracketed are or ever have been certified by a MAS certification program, nor does it confer certification of any kind upon the materials or products tested or bracketed.

Emissions generally decay over time, and the representativeness of the analytical data reported is directly dependent upon the age and conditions under which the tested sample was received.



APPENDIX A

GENERAL TESTING PARAMETERS AND DATA

Under the provisions of the testing method referenced in this report, testing consisted of the following procedural steps:

- Storage of test specimens in original shipping containers prior to emissions testing for up to 10 days in a ventilated and conditioned room maintained at a temperature of $23 \pm 2^\circ\text{C}$ and a relative humidity of $50\% \pm 15\%$.
- For quality assurance purposes the emission chamber was cleaned and air purged prior to testing. Air samples were collected and analyzed from the chamber exhaust prior to loading to establish background levels.
- Collection of air samples at method-specified intervals from the chamber exhaust port utilizing mass flow controllers calibrated at 180 cc/min for VOCs and 150 cc/min for aldehydes.
- Tenax TA[®] tubes are used for VOC analysis performed by thermal desorption gas chromatography/mass spectrometry (TD-GC/MS) using a modified EPA TO-17 method. Samples are also collected on DNPH tubes for aldehyde analysis performed using high performance liquid chromatography (HPLC) using a modified NIOSH 2016 method. All samples are drawn and analyzed in duplicate.
- Instrument calibration, analysis of quality control samples and quantitation of the CDPH target list of 35 chemicals of concern, and reporting and speciation of top 10 tentatively identified compounds.

The operating parameters for the small-scale emissions chamber used for this project included:

Parameter	Value	Parameter	Value
Chamber Volume	0.053 m ³	Area Specific Flow Rate	2.4 m/h
Loading Factor	0.425 m ² /m ³	Temperature	$23 \pm 1^\circ\text{C}$
Air Exchange Rate	$1.0 \pm 0.05\text{ h}^{-1}$	Relative Humidity	$50 \pm 5\%$

Total volatile organic compounds (TVOC) are defined as the compounds eluting between hexane (*n*-C₅) and hexadecane (*n*-C₁₇) and in this protocol quantified as toluene. Table A-I presents the measured concentration and emission factor of TVOC at each of the three sampling intervals.

Table A-I
Total Volatile Organic Compounds (TVOC) between n-C₅ and n-C₁₇ Measured by GC/MS*

Sample Interval (hours)	TVOC Concentration (µg/m ³)	TVOC Emission Factor (µg/m ² h)
24	45	110
48	42	98
96	34	80

*TVOC values are background corrected



Table A-II presents measured concentrations and emission factors of formaldehyde and acetaldehyde at each of the three sampling intervals.

Table A-II
Formaldehyde and Acetaldehyde Concentrations and Emission Factors as Measured by HPLC

Sample Interval hours	Target Compound	Concentration ($\mu\text{g}/\text{m}^3$)	Emission Factor ($\mu\text{g}/\text{m}^2 \text{ h}$)
24	Formaldehyde	<1.4	<3.2
48	Formaldehyde	1.5	3.5
96	Formaldehyde	<1.4	<3.2
24	Acetaldehyde	1.8	4.3
48	Acetaldehyde	1.8	4.3
96	Acetaldehyde	1.8	4.3

Table A-III present the individual volatile organic compounds (IVOC) identified by GC/MS after 96 hours.

Table A-III
Speciation of Tentatively Identified IVOCs* by GC/MS after 96 hours

CAS Number	Tentatively Identified Compounds	Concentration ($\mu\text{g}/\text{m}^3$)	Emission Factor ($\mu\text{g}/\text{m}^2 \text{ h}$)
80-56-8	alpha-pinene	6.4	15
100-42-5	styrene	5.3	12
13466-78-9	delta-3-carene	5.0	12
66-25-1	hexanal	5.0	12
149-57-5	2-ethylhexanoic acid	2.7	6.3
67-63-0	isopropanol	2.2	5.3
872-50-4	1-methyl-2-pyrrolidone	1.6	3.9
124-19-6	nonanal	<1.2	<2.9
018172-67-3	beta-pinene	1.5	3.6
5989-27-5	limonene	1.5	3.5

*All IVOCs detected were identified using the average response factor of toluene calibration standards. The sum concentration of IVOC's does not necessarily correlate with the TVOC concentration under the analytical conditions.



APPENDIX B

Chain-of-Custody

2000338



Materials Analytical Services LLC
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 Suwanee, Georgia 30024
 Phone: 770-866-3200
 Fax: 770-866-3293

City of Suwanee
 Public Health
 Standard Method (section 01350)
 Emission Testing
 Chain-of-Custody

Client Information
Company: mafi-America, Inc.
Street Address: 300 E 42nd Street
City/State: New York, NY
Zip/Postal Code: 10017
Country: USA
Contact Name: Walter Loune
Title: Ambassador
Phone Number: +1 917 488 0410
Fax Number:
Email Address: w.loune@mafi.com

Testing Specifications (per MAS) check appropriate test below
<input type="checkbox"/> R&D (custom): Specify Details
<input type="checkbox"/> 24-hour Comparative R&D Test
<input type="checkbox"/> 72-hour Comparative R&D Test
<input checked="" type="checkbox"/> 14-day CDPH Compliance Test
<input type="checkbox"/> CARB Formaldehyde Test

Manufacturer Information (if different than client)
Company: mafi Naturholzsysteme GmbH
City/State/Country: Schneegattern, Austria
Contact Name/Title: Yvonne Goldfuss
Phone Number: 0043 746 2711

Construction Details (as applicable)
Covering Type: Fabric <input type="checkbox"/> (Primary Fiber type: _____), Vinyl <input type="checkbox"/> , Leather <input type="checkbox"/>
Plastic Type(s): Nylon <input type="checkbox"/> , PVC <input type="checkbox"/> , PE <input type="checkbox"/> , PP <input type="checkbox"/> , PU <input type="checkbox"/> , PS <input type="checkbox"/> , PC <input type="checkbox"/> , ABS <input type="checkbox"/> , Acrylic <input type="checkbox"/> , Lexan <input type="checkbox"/>
Substrate Type(s): MDF <input type="checkbox"/> , Particle Board <input type="checkbox"/> , Plywood <input type="checkbox"/> , Solid Wood <input checked="" type="checkbox"/> , Other <input type="checkbox"/>
Outfit Finish Type(s): Oil Base <input type="checkbox"/> , Water Base <input type="checkbox"/> , Catalyzed/Conversion Var <input type="checkbox"/> , Polyurethane <input type="checkbox"/> , Plastic Laminate <input type="checkbox"/> , Melamine <input type="checkbox"/> , UV <input type="checkbox"/> , Other <input checked="" type="checkbox"/>
Foam Type: Polyurethane <input type="checkbox"/> , Memory <input type="checkbox"/> , Latex <input type="checkbox"/> , Ewon <input type="checkbox"/> , High Resilience <input type="checkbox"/> , High Density <input type="checkbox"/>
Paint Type: Latex <input type="checkbox"/> , Oil <input type="checkbox"/> , Low VOC <input type="checkbox"/> , No VOCs <input type="checkbox"/> , PowderCoat <input type="checkbox"/> , Chrome <input type="checkbox"/>

Sample Details
Unique Sample ID (if applicable): LAEB BLW
Product Name & Catalog #: Larch Brushed Lye treated white oil
Product Type: Ceiling/Wall Panels <input type="checkbox"/> , Flooring <input checked="" type="checkbox"/> , Trim <input type="checkbox"/> , Wall Paint <input type="checkbox"/> , Wall Coverings <input type="checkbox"/> , Thermal Insulation <input type="checkbox"/> , Adhesives <input type="checkbox"/> , Ceiling Tiles <input type="checkbox"/> , Other <input type="checkbox"/>
Date of Product Manufacturing Completion: 03/09/2020
Sample Location: Factory <input checked="" type="checkbox"/> , Warehouse <input type="checkbox"/> , Production Stack/Roll <input type="checkbox"/> , Container <input type="checkbox"/>
Sample Submitted by: Yvonne Goldfuss
Date of Sample Shipment: 03/10/2020
Number of Boxes or Pallets: 1

Special Notes or Comments from Manufacturer:
our product is solid wood layers glued together with Polyvinylacetate

Shipping Details
Packed By: Yvonne Goldfuss
Shipping Date: 03/10/2020
Carrier/Airbill Number: DHL 4880560834

Laboratory Receipt (to be completed by Laboratory Representative)
Received By: <i>S. Lyell</i>
Received Date: <i>03-12-20</i>
Condition of Shipping Package: <i>good</i>
Condition of Sample:
Remarks:

Sample Handling				
Relinquished By	Company	Received By	Company	Date/Time
		<i>S. Lyell</i>	<i>MS</i>	<i>3-12-20</i>



Shipping Package Inspected By:
 1. *SL* Date: *3-13-20*
 2. *W* Date: *03/13/20*



APPENDIX C

CDPH, CHPS, and LEED v4.1 Compliant Products*

mafi-America, Inc.

Flooring Products

Beech	Douglas Fir	Oak	Ash
Larch*	Walnut	Fir	Swiss Stone Pine

Flooring Treatments

Natural	Vulcano	Coral	Fresco
Carving	Lye Treated*	Tiger Oak	

* Product tested as representative exemplar of products listed above. Claims of compliant products are made under the criteria in Section 8.3 of the CDPH Standard Method and/or Section 9.1 of ANSI/BIFMA M7.1-2011 (R2016).

Per ANSI/BIFMA and CDPH standards, products must be re-evaluated if significant changes to materials, processes, or the facility occur that affect the eligibility of the products for any credits available under these or other applicable standards. Regardless, the frequency of compliance assessment for ANSI/BIFMA shall not exceed three years. Third-party certification programs may require more frequent compliance testing.