ALSEAL MARKETING SDN. BHD. Co.No.: 200301022720 (625140-D)
No. 86, Jalan Industri 3/3, Rawang Integrated Industrial Park, 48000 Rawang, Selangor.
Tel: +603-6094 2088 **Fax:** +603-6099 2930 **Email:** info@alsealmarketing.com
Website: www.alsealmarketing.com

Our reference: 25/H22/LTR/Y485

25th August 2022

Dear Valued Customer / Business Partners,

RE: AS-4001 MS Construction Sealant Statement of Product Compliance

This letter is to elaborate on AS-4001 MS Construction Sealant contributing to Leadership in Energy and Environmental Design (LEED) v4.1 credit. The EQ Credit: Low-Emitting Materials requires 75 % of adhesives and sealants to meet the volatile organic compound (VOC) emissions evaluation and 100 % of adhesives and sealants to meet the VOC content evaluation.

For VOC emissions, the product is to be tested as per the California Department of Public Health (CDPH) Standard Method v1.2-2017. The product must comply with the VOC allowable concentration listed in Table 4-1 of the standard method. The total VOC (TVOC) after 14 days is required to be reported in ranges as specified in the standard method.

The parameters for the modelling scenario are as follows:

Parameter	**Value**	
	Standard School Classroom	**Standard Private Office**
Volume	231 m^3	30.6 m^3
Air change rate	0.82 hr^{-1}	0.68 hr^{-1}
Estimated exposed area	1.62 m^2	0.21 m^2

The TVOC of AS-4001 MS Construction Sealant after 14 days is as follow:

Elapsed exposure hour after 10 days conditioning	**Predicted Air Concentration**	
	Standard School Classroom	**Standard Private Office**
96	0.5 mg/m^3 or less	0.5 mg/m^3 or less

Formaldehyde content was not detected for all results (refer to Table 2 and Table 3 of test report 7191274108-CHM22-05-MA-AD2-CR1).

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For VOC content, the product is to be tested as per the South Coast Air Quality Management District (SCAQMD) Rule 1168. The VOC content of AS-4001 MS Construction Sealant is <10g/L (refer to certificate CCN18070084H03-0). This is below the VOC limit (50g/L) under "All Other Architectural Sealants" category.

Based on the test result of VOC emission (test report 7191274108-CHM22-05-MA-AD2-CR1) and VOC content (certificate CCN18070084H03-0), AS-4001 MS Construction Sealant complies to requirements of LEED v4.1 EQ Credit: Low-Emitting Materials.

Should you require any additional information, please do not hesitate to contact us.

Thank you.

Yours sincerely,

For Alseal Marketing Sdn. Bhd.

Prepared by: Yap Wai Hoong
(R&D Chemist)

Verified by: Alex Ng
(General Manager (Technical))

TEST REPORT: 7191274108-CHM22-05-MA-AD2-CR1
(Re-issue dated: 22 AUG 2022)

PSB Singapore

Add value.
Inspire trust.

Date: 12 JUL 2022 Tel: +65 6973 6176

Client's Ref: 221420148 Email: Sihai.Li@tuvsud.com

Note: This report is issued subject to the Testing and Certification Regulations of the TÜV SÜD Group and the General Terms and Conditions of Business of TÜV SÜD PSB Pte Ltd. In addition, this report is governed by the terms set out within this report.

SUBJECT

Evaluation of "AS-4001" product sample in accordance with CDPH/EHLB/Standard Method Version 1.2

CLIENT

Alseal Marketing Sdn. Bhd.
No. 86, Jalan Industri 3/3,
Rawang Integrated Industrial Park
48000 Rawang,
Selangor DE

DESCRIPTION OF SAMPLE

Two 600 ml tubes of sample labelled as followed were received on 29 April 2022. Sample was submitted by Vital Technical Sdn Bhd:

Product Name	MS Construction Sealant
Model / Series	AS-4001
Product Type	Sealant

DATE OF ANALYSIS

21 May 2022 – 06 Jul 2022

Amendment history
This test report 7191274108-CHM22-05-MA-AD2-CR1 was amended on 22 Aug 2022 from test report 7191274108-CHM22-05-MA-AD2. Under "Description of Sample", the product name was amended from "LM MS Sealant" to "MS Construction Sealant" due to typographical error.

Note:

1. No physical test sample was submitted for testing for the specific product which is the subject of this additional test report.

2. Test results stated in this additional test report was based exclusively on the test results of a past submitted and tested sample reported in Test report No. 7191274108-CHM22-05-MA dated 12 JUL 2022.

3. This additional test report was issued on the basis of the declaration by the Customer that the specific product which is the subject of this additional test report is exactly the same as the original sample provided for Test report No. 7191274108-CHM22-05-MA dated 12 JUL 2022 in terms of technical specification and performance.

4. Details of the product, including name, brand, article number and any technical specification are solely provided by the Customer. No verification has been done by TUV SUD PSB Pte Ltd whether such details are true and correct.

5. Details of Customer's declaration are as follows :

Company Name :	Vital Technical Sdn. Bhd.
Address :	No. 93, Jalan Industri 3/3, Rawang Integrated Industrial Park, 48000 Rawang, Selangor DE, Malaysia
Name of Authorised person :	Mr Cheong Chee Leong
Contact Telephone / Email address :	+603-60942088 / cl.cheong@vitaltechnical.com

METHOD OF TEST

1. Emission Test

The following emission tests were conducted according to CDPH/EHLB/Standard Method Version 1.2 – *Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers*

1) Total Volatile Organic Compounds (TVOC) Emission Rate
2) Formaldehyde Emission Rate

Emission Test Condition

1)	Chamber Volume:	about 1m^3
2)	Temperature:	23°C
3)	Relative Humidity:	50%
4)	Air Exchange Rate:	n=1 (air change rate per hour in the chamber)
5)	Chamber Loading Ratio:	0.3-1.0 m^2/m^3 (total exposed surface area of the test specimen divided by the net air volume of the emission test chamber)
6)	Air Velocity:	0.1 m/s to 0.3 m/s (over the surface of the test specimen)

Note: Chamber Loading ratio for the tested sample: 0.007 m^2/m^3

2. Sampling, Desoprtion, Analysis

1) For analysis, the air was sampled using constant flow rate pumps, equipped with absorbent containing Tenax TA to trap VOCs. (sampling and assay carried out according to ISO 16000-6 / ASTM D5116).
2) In addition, the air was sampled using constant flow rate pumps, provided with absorbent containing di-nitrophenylhydrazine (DNPH) grafted silica cartridge to trap aldehydes. (sampling and assay performed according to ISO 16000-3)
3) The Tenax samples were then desorbed by Automated Thermal Desorber System and then analyzed by Gas Chromatography coupled with Mass Spectrometry (ATD-GCMS).
4) The samples on DNPH cartridge were then desorbed to form the stable compound hydrazone, which was then assayed by Liquid Chromatography (HPLC) with UV / Diode Array Detector.

METHOD OF TEST *(cont')*

3. Calculation of Results

Air Concentration Determinations

Emission Factor Calculations

EF = C X (N/L)

EF = emission factor (µg/m^2·hr) or (µg/unit·hr)
C = chamber concentration (µg/m^3)
N = chamber air exchange rate (hr^{-1})
L = product loading (m^2/m^3)

The model measurements were made with the following assumptions: air within open office areas of the building is well-mixed at the breathing level zone of the occupied space; environmental conditions are maintained at 50 % relative humidity and 23°C (73°F); there are no additional sources of these pollutants; and there are no sinks or potential re-emitting sources within the space for these pollutants.

The predicted exposure concentrations ($C_{P,t}$) (µg/m^3) are calculated from the modelled emission factors as:

$$C_{P,t} = EF_{m,t}\left(\frac{A}{V}\right)\left(\frac{1}{N}\right)$$

where,

$C_{P,t}$ = predicted exposure concentration at time t (µg/m^3)
$EF_{m,t}$ = modelled emission factor at time t (µg/m^2·hr) or (µg/unit·hr)
A = product area exposed in room (m^2 or unit)
V = room volume (m^3)
N = room air change per hour (hr^{-1})

The model was set as Private Office and/or Standard Classroom scenario as defined in Table 4-4 and Table 4-5 with reference to California Department of Public Health (CDPH) *Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers* V 1.2 (2017). The following parameters are used for estimating VOC air concentrations at 336 hours for the modelling scenarios.

Parameter	Units	Value	
		Standard Classroom	Private Office
Volume	m^3	231	30.6
Air Change Rate	1/h	0.82	0.68
Loading Factor *	m^2/m^3	0.007	0.007
Estimated Exposed Area	m^2	1.62	0.21

* Based on Clause 4.2.2 of EN16516 - Construction products: Assessment of release of dangerous substances – Determination of emissions into indoor air. Loading factor for very small surfaces, e.g. sealants.

RESULTS

Table 1. Summary of TVOC Chamber Concentrations, Emission Factors and Predicted Air Concentrations for "AS-4001"

Elapsed Exposure Hour after 10 Days Conditioning *	Chamber Concentrations ($\mu g/m^3$)	Emission Factor ($\mu g/m^2 \cdot hr$)	Predicted Air Concentration ($\mu g/m^3$)	
			Standard Classroom	Private Office
0 (Background)	BQL	BQL	-	
24	44.0	5863.7	49.6	60.7
48	22.8	3047.0	25.8	31.5
96	24.2	3226.8	27.3	33.4

* Exposure hours are nominal (± 1 hour)
BQL = Below quantifiable level of 0.02 µg based on a standard 12 L air collection volume

Table 2. Summary of Formaldehyde Chamber Concentrations, Emission Factors and Predicted Air Concentrations for "AS-4001"

Elapsed Exposure Hour after 10 Days Conditioning *	Chamber Concentrations ($\mu g/m^3$)	Emission Factor ($\mu g/m^2 \cdot hr$)	Predicted Air Concentration ($\mu g/m^3$)	
			Standard Classroom	Private Office
0 (Background)	BQL	BQL	--	--
24	BQL	BQL	--	--
48	BQL	BQL	--	--

* Exposure hours are nominal (± 1 hour)
BQL = Below quantifiable level of 0.05 µg based on a standard 30 L air collection volume

RESULTS *(cont'd)*

Table 3. Chamber Concentrations, Emission Factors and Predicted Air Concentrations of Target CRELs Compounds for "AS-4001" at 96 Hours Following 10 Day of Conditioning.

Cas Number	Target CRELs Compound Name	Chamber Concentrations (µg/m³)	Emission Factor (µg/m²·hr)	Predicted Air Concentration (µg/m³)		Half CREL (µg/m³)
				Standard Classroom	Private Office	
75-07-0	Acetaldehyde	BQL	BQL	--	--	70
71-43-2	Benzene†	BQL	BQL	--	--	1.5
75-15-0	Carbon Disulfide	BQL	BQL	--	--	400
56-23-5	Carbon Tetrachloride	BQL	BQL	--	--	20
108-90-7	Chlorobenzene†	BQL	BQL	--	--	500
67-66-3	Chloroform	BQL	BQL	--	--	150
106-46-7	Dichlorobenzene (1,4-)†	BQL	BQL	--	--	400
75-35-4	Dichloroethylene (1,1)	BQL	BQL	--	--	35
68-12-2	Dimethylformamide (N,N)†	BQL	BQL	--	--	40
123-91-1	Dioxane (1,4-)†	BQL	BQL	--	--	1500
106-89-8	Epichlorohydrin†	BQL	BQL	--	--	1.5
100-41-4	Ethylbenzene†	BQL	BQL	--	--	1000
107-21-1	Ethylene Glycol	BQL	BQL	--	--	200
110-80-5	Ethylene Glycol Monoethyl Ether	BQL	BQL	--	--	35
111-15-9	Ethylene Glycol Monoethyl Ether Acetate	BQL	BQL	--	--	150
109-86-4	Ethylene Glycol Monomethyl Ether	BQL	BQL	--	--	30
110-49-6	Ethylene Glycol Monomethyl Ether Acetate	BQL	BQL	--	--	45
50-00-0	Formaldehyde	BQL	BQL	--	--	9
110-54-3	Hexane (n-)†	BQL	BQL	--	--	3500
78-59-1	Isophorone	BQL	BQL	--	--	1000
67-63-0	Isopropanol†	BQL	BQL	--	--	3500
71-55-6	Methyl Chloroform	BQL	BQL	--	--	500
75-09-2	Methylene Chloride	BQL	BQL	--	--	200
1634-04-4	Methyl t-Butyl Ether†	BQL	BQL	--	--	4000
91-20-3	Naphthalene†	BQL	BQL	--	--	4.5
108-95-2	Phenol†	BQL	BQL	--	--	100
107-98-2	Propylene Glycol Monomethyl Ether	BQL	BQL	--	--	3500
100-42-5	Styrene†	BQL	BQL	--	--	450
127-18-4	Tetrachloroethylene†	BQL	BQL	--	--	17.5
108-88-3	Toluene†	BQL	BQL	--	--	150
79-01-6	Trichloroethylene†	BQL	BQL	--	--	300
108-05-4	Vinl Acetate	BQL	BQL	--	--	100
108-38-3 /95-47-6 /106-42-3	Xylenes†	BQL	BQL	--	--	350

* Indicates Wiley ver. 8.0 best library match only based on retention time and mass spectral characteristics
† Denotes quantified using authentic standard curve. Other VOCs quantified relative to toluene
BQL = Below quantifiable level of 2.0 µg/m³

RESULTS *(cont'd)*

Table 4. Chamber Concentrations, Emission Factors and Predicted Air Concentrations of Identified Individual Organic Compounds (VOCs) for "AS-4001" at 96 Hours Following 10 Day of Conditioning for Standard Classroom and Private Office scenario.

Cas Number	Compound Identified	Chamber Concentrations ($\mu g/m^3$)	Emission Factor ($\mu g/m^2 \cdot hr$)	Predicted Air Concentration ($\mu g/m^3$)		Half CREL ($\mu g/m^3$)
				Standard Classroom	Private Office	
57-55-6	1,2-Propanediol	1.4	194.5	1.6	2.0	not listed
110453-78-6	(S)-(+)-6-Methyl-1-Octanol	3.8	507.7	4.3	5.2	not listed

* Indicates Wiley ver. 8.0 best library match only based on retention time and mass spectral characteristics
† Denotes quantified using authentic standard curve. Other VOCs quantified relative to toluene
BQL = Below quantifiable level of 2.0 $\mu g/m^3$

MS LOO SHIRLYN
CHEMIST

DR LI SIHAI
AVP / SENIOR CHEMIST
MICROCONTAMINATION DIAGNOSIS
CHEMICAL & MATERIALS

Please note that this Report is issued under the following terms :

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Effective 26 January 2021

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CERTIFICATE OF ANALYSIS

ALSEAL MARKETING SDN. BHD.
Lot 2291, Jalan Kampung Baru,
Kg. Baru Sungai Buloh, 47000 Selangor DE.

Tel : +603-6157 9698 Fax :
Attn :

Certificate No	:	CCN18070084H03-0
Sample Received Date	:	13-Jul-2018
Complete Analysis Date	:	27-Jul-2018
Date Issued	:	27-Jul-2018

Sample Description : Product Name: MS Construction Sealant
Product Code: AS-4001
Brand: Alseal

Analysis Results :

PARAMETER	ANALYSIS RESULTS	UNIT	STANDARD METHOD / TECHNIQUE / EQUIPMENT USED
VOC	ND(<10)	g/L	USEPA method 24 under SCAQMD Rule 1168 (Architectural Sealants, <250g/L)

ND denotes not detected (< ***Numeric number***) denotes detection limits

Remark : -

Cheng Pui Wah
Senior Chemist
B.Sc.(Hons),
L/1828/6037/11

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