Test Report

Guialmi – Empresa de Móveis Metálicos, SA

Product Emissions of Furniture
in accordance with
ANSI/BIFMA M7.1-2011

L. System desk

June 2013

Client:	**Guialmi – Empresa de Móveis Metálicos, SA** Apartado 1 – Aguada de Cima 3754-908 Águeda Portugal
Date:	17 June 2013
Testing Laboratory:	Eurofins Product Testing A/S Smedeskovvej 38, DK-8464 Galten, Denmark

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Introduction

On 28 May 2013 Eurofins Product Testing A/S received desk sample named

L. System desk
Date of production: 05-2013

for emissions testing in accordance with ANSI/BIFMA M7.1-2011. The sample was clearly labelled, properly packaged and not damaged. Testing was carried out in the laboratories of Eurofins Product Testing A/S. Before starting the testing procedure on 3 June 2013 the sample had been stored unopened at room temperature.

1 Description of the Applied Testing Method

The applied method complies with the test method as defined in ANSI/BIFMA M7.1-2011 “American National Standard for Office Furnishing” with the limit values as defined in ANSI/BIFMA X7.1-2011. The internal method numbers are: 9810; 9811, 9812, 2802, 2803 , 8400.

1.1 Test Specimen

A sample was sent by the client to the laboratory of Eurofins Product Testing A/S in an airtight package. The package was opened and the test specimen was transferred uncovered into a test chamber immediately (internal method no.: 9810). Size of the test specimen was 30 x 40 cm.

1.2 Test Chamber

The test chamber was consisting of stainless steel and had a volume of 119 l. The air clean-up was realized in multiple steps. Before loading the chamber a blank check of the empty chamber was performed. The operation parameters were 23 °C, 50 % relative air humidity (in the supply air) with an air exchange rate of 0.5 per hour. The loading of the test chamber was 1 m² test specimen per m³ air volume (internal method 9811).

1.3 Sampling, Desorption, Analyses

1.3.1 VOC Emissions Testing after 3 and 7 Days

The emissions of organic compounds after 3 and after 7 days were tested by drawing air samples from the chamber outlet through Tenax TA tubes (main tube and backup tube) after 3 and after 7 days. Analyses were done by thermal desorption and gas chromatography / mass spectroscopy (internal methods no.: 9812 / 2808). All single substances were identified if the toluene equivalent in the Total Ion Chromatogram (TIC) exceeded 2 µg/m³. Quantification was done with the respective response factor and the TIC signal, or in case of overlapping peaks by calculating with fragment ions. All non-identified substances were quantified as toluene equivalent if giving more than 2 µg/m³.

The results of the individual substances were calculated in three groups depending on their appearance in a gas chromatogram when analysing with a non-polar column (HP-1):

- Volatile organic compounds VOC: All substances appearing between these limits.
- Very volatile organic compounds VVOC: All substances appearing before n-hexane (n-C_6).
- Semi-volatile organic compounds SVOC: All substances appearing after n-hexadecane (n-C_{16}).

Calculation of the $TVOC_{SumVOC}$ (Total Volatile Organic Compounds) was done by addition of the results of all individual substances between C_6 and C_{16}.

Calculation of the $TVOC_{Toluene}$ (Total Volatile Organic Compounds) was done by addition of the results of all substances between C_6 and C_{16} as toluene equivalent.

This test covered only substances that can be adsorbed on Tenax TA and that can be thermally desorbed. If other emissions occurred then these could not be monitored (or with limited reliability only).

1.3.2 Testing of Aldehydes after 3 and 7 Days

The presence of formaldehyde and acetaldehyde was tested by drawing air samples from the chamber outlet through DNPH-coated silicagel tubes after 3 and 7 days. Analysis was done by solvent desorption, HPLC and UV-/diode array detection (ISO 16000-3, internal methods no.: 9812 / 8400).

The absence of the aldehydes was stated if the specific wavelength UV detector response was lacking at the specific retention time in the chromatogram. Otherwise it was checked whether the detection limit was exceeded. In this case the identity was finally checked by comparing full scan sample UV spectra with full scan standard UV spectra.

1.3.3 Deviation from the test method

No deviations.

1.3.4 Accreditation

The testing methods described above have been accredited (EN ISO/IEC 17025:2005) by DANAK (no. 522). But some parameters are not yet covered by that accreditation. At present the accreditation does not cover the parameters marked with a note *. But the analysis was done for these parameters at the same level of quality as for the accredited parameters.

1.4 Uncertainty of the test method

The relative standard deviation of the test method is amounted to 22% (RSD). The expanded uncertainty U_m is 45% and equals 2 x RSD%, see also www.eurofins.dk, search: Uncertainty.

1.5 Calculation of results

Calculation of emission factors after 14 days:

The emission factor after 14 days was calculated by using equation 8, 9, 10 as given in ANSI/BIFMA M7.1-2011:

$$E_{14} = a \cdot 336^{-b}$$

with E_{14}= Emission factor after 14 days (t=336 hours) and with

$$b = \frac{\ln E(t_1) - \ln E(t_2)}{\ln t_2 - \ln t_1}$$

$$a = E(t_1) \cdot t_1^{\ b} = E(t_2) \cdot t_2^{\ b}$$

with t_1 = 72 hours (3 days) and t_2 = 168 hours (7 days).

2 Results

2.1 Concentrations and Emission factors

L. System desk	CAS No.	Retention time min	ID-Cat.	Chamber air concentrations, µg/m³		Emission factor, µg/(m²h)			b	a
				3 days	7 days	3 days	7 days	14 days#		
$TVOC_{SumVOC}$ (C_6-C_{16})	-	-	-	1100	930	540	460	500	0.189	1213
$TVOC_{Toluene}$ (C_6-C_{16})	-	-	-	970	800	480	400	440	0.215	1205
Single VOC Sub-stance:										
Pentanal	110-62-3	3.07	1	56	46	28	23	26	0.232	75.6
Toluene	108-88-3	4.38	1	25	19	12	9.3	8	0.301	43
Hexanal	66-25-1	5.08	1	180	160	89	78	84	0.156	173
Not identified *	-	6.96	4	5.2	3.2	2.6	1.6	1	0.573	30
a-Pinene *	80-56-8	7.76	2	170	340	87	170	294	-0.791	3.0
Camphene	79-92-5	8.02	1	4.1	7.9	2	4	7	-0.818	0.1
b-Pinene	127-91-3	8.49	1	45	44	22	22	22	0.000	22
Not identified *	-	8.67	4	18	14	8.9	7.1	6	0.267	28
Octanal	124-13-0	8.86	1	16	12	8.2	6.2	5	0.330	34
3-Carene *	13466-78-9	9.00	1	3.9	2.3	1.9	1.1	1	0.645	30
Limonene	138-86-3	9.27	1	51	33	25	17	12	0.455	175
Fenchol *	1632-73-1	10.46	2	3.2	2.6	1.6	1.3	1	0.245	4.6
Longicyclene *	1137-12-8	13.46	2	7.7	3	3.8	1.5	1	1.097	414
Longifolene *	475-20-7	13.82	2	28	18	14	9.1	6	0.508	123
BHT *	128-37-0	14.65	2	300	160	150	81	49	0.727	3364
Volatile Aldehydes measured with DNPH-Method (see 1.3.2)										
Formaldehyde	50-00-0	-	-	45	42	23	21	22	0.107	36.4
Acetaldehyde	75-07-0	-	-	63	46	32	23	18	0.390	169.5

n.d. Not detected
< Means less than
* Not a part of our accreditation, see 1.3.4.
# Calculated value, see 1.5

2.2 Concentrations after 7 days (Working surface)

L. System desk	CAS No.	Retention time min	ID-Cat.	Concentration Open Plan Office TVOC mg/m^3	Concentration Private Office TVOC mg/m^3	Emissions Limits system furniture [a]	Emissions Limits Seating[a]
$TVOC_{Toluene}$ (C_6-C_{16})	-	-	-	0.2	0.1	≤ 0.5 mg /m^3	≤ 0.25 mg /m^3
Formaldehyde	50-00-0	-	-	7 ppb	3.3 ppb	≤ 50 ppb	≤ 25 ppb
Total Aldehydes	-	-	-	17 ppb	8.4 ppb	≤ 100 ppb	≤ 100 ppb
4-Phenylcyclohexene	4994-16-5	-	-	< 1	< 1	≤ 0.0065 mg/m^3	≤ 0.00325 mg/m^3

n.d. Not detected
< Means less than
* Not a part of our accreditation, see 1.3.4.
** Calculated as average of the two samplings because of constant emissions (–0.25<b<0.25)
a These limits apply to Option B for receiving the EQ Credit 4.5 in LEED CI

Categories of identity:

1 = definitely identified, specifically calibrated
2 = identified by comparison with a mass spectrum obtained from a library, identity supported by other information, calibrated as toluene equivalent
3 = identified by comparison with a mass spectrum obtained from a library, calibrated as toluene equivalent
4 = not identified, calibrated as toluene equivalent

3 Interpretation of the results

The results of L. System desk can be summarised as follows:

- The Total VOC concentration was **below** the classification threshold of 0.5 mg/m³ for system furniture calculated for an open plan office environment and for a private office environment.
- The formaldehyde concentration was **below** the classification threshold of 50 ppb for system furniture calculated for an open plan office environment and for a private office environment.
- The total aldehyde concentration was **below** the classification threshold of 100 ppb calculated for an open plan office environment and for a private office environment.
- The concentration of 4-Phenylcyclohexene was below the classification threshold of 0.0065 mg/m³ for system furniture calculated for an open plan office environment and private office environment.

The tested product L. System desk complies with the requirements in Option B for receiving the EQ Credit 4.5 in LEED CI.

Appendix 1: Photo of the sample