Test Report

HOWE A/S

Product Emissions of a seating
in accordance with

ANSI/BIFMA M7.1-2007
40/4 Veneer

October 2010

Client:	**HOWE A/S** Mandal Alle 23 5500 Middelfart Denmark
Date:	13 October 2010
Testing Laboratory:	Eurofins Product Testing A/S Smedeskovvej 38, DK-8464 Galten, Denmark

Thomas Neuhaus
Head of product emission test centre

Martin Møller Pedersen
M.Sc. (Pharm)

The results are only valid for the tested sample(s).
This report may only be copied or reprinted in its entity, parts of it only with a written acceptance by Eurofins Product Testing A/S.

Table of Contents

Introduction

On 7 September 2010 Eurofins Product Testing A/S received a seating sample named

40/4 Veneer
Batch: 53865, Date of production: 25 August 2010

for emissions testing in accordance with ANSI/BIFMA M7.1-2007. The sample was clearly labeled, properly packaged and not damaged. Testing was carried out in the laboratories of Eurofins Product Testing A/S. Before starting the testing procedure on 13 September 2010 the sample had been stored unopened at room temperature.

The testing result of the 40/4 chair is also representative of the 40/4 Barstool, 40/4 Lounge and 40/4 Swivel according to information from the manufacturer.

The results are only valid for the tested sample(s).
This report may only be copied or reprinted in its entity, parts of it only with a written acceptance by Eurofins Product Testing A/S.

1 Description of the Applied Testing Method

The applied method complies with the test method as defined in ANSI/BIFMA M7.1-2007 “American National Standard for Office Furnishing” with the limit values as defined in ANSI/BIFMA X7.1-2007. The internal method numbers are: 9810; 9811, 9812, 2802, 2803 , 8400.

1.1 Test Specimen

A seating 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 into a test chamber immediately (internal method no.: 9810).

1.2 Test Chamber

The test chamber was consisting of stainless steel and had a volume of 0.119 m^3. 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 test specimen per chamber (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 uncertainty amounted to ± 20 % (RSD).

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).

The results are only valid for the tested sample(s).
This report may only be copied or reprinted in its entity, parts of it only with a written acceptance by Eurofins Product Testing A/S.

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. The uncertainty amounted to ± 20% (RSD).

1.3.3 Deviation from the test method

The volume of test chamber was 119 l.

1.3.4 Accreditation

The testing methods described above have been accredited (EN ISO/IEC 17025:2005) by DANAK (no. 168). 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.

The results are only valid for the tested sample(s).
This report may only be copied or reprinted in its entity, parts of it only with a written acceptance by Eurofins Product Testing A/S.

1.3.5 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 M7.1-2007:

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

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).

Calculation of model room air concentrations after 14 days (chairs):

Model room concentrations were calculated by following formula:

$$C = \frac{A \cdot E}{Q}$$

with:
C model room concentration, µg/m^3
A number of seats = 1
E Unit specific emission factor, µg/(unit*h)
Q Ventilation rate, chair: 24.8 m^3/h

The results are only valid for the tested sample(s).
This report may only be copied or reprinted in its entity, parts of it only with a written acceptance by Eurofins Product Testing A/S.

2 Results

2.1 Emission factors

40/4 Veneer	CAS No.	Retention time min	ID-Cat.	Chamber air concentration, µg/m³		Emission factor, µg/(unit*h)			b	a
				3 days	7 days	3 days	7 days	14 days #		
$TVOC_{SumVOC}$ (C_6-C_{16})				2700	2200	270	220	190	0.242	755.3
$TVOC_{Toluene}$ (C_6-C_{16})				1700	1200	170	120	90	0.411	981.3
Single VOC Substance:										
iso-Butanol (2-Methyl-1-propanol) *	78-83-1	2.47	1	530	430	32	26	22	0.25	91
1-Butanol	71-36-3	2.71	1	540	470	32	28	25	0.16	65
Pentanal *	110-62-3	2.97	1	100	93	6.0	5.5	5.2	0.086	8.6
Hexanal *	66-25-1	4.71	1	410	390	24	23	22	0.059	31
Sum of Octanal * and Hexanoic acid	124-13-0 142-62-1	9.28-9.39	1	280	120	17	7.1	3.6	1.0	1200
Sum of not identified VOC, C10-C16	-	9.5-16.3	4	280	130	17	7.7	4.1	0.91	800
Sum of C10-Aromates	-	10.2-1.6	3	120	60	7.1	3.6	2.0	0.82	240
Volatile Aldehydes measured with DNPH-Method (see 1.3.2)										
Formaldehyde	50-00-0	-	1	680	620	68	62	57	0.109	107.9
Acetaldehyde	75-07-0	-	1	25	22	2.5	2.2	2.0	0.151	4.7

n.d. Not detected
< Means less than
* Not a part of our accreditation, see 1.3.4.
# Calculated value, see 1.3.5

The results are only valid for the tested sample(s).
This report may only be copied or reprinted in its entity, parts of it only with a written acceptance by Eurofins Product Testing A/S.

2.2 Concentration after 14 days (chair)

40/4 Veneer	CAS No.	Retention time min	ID-Cat.	Emission factor µg/(unit*h)	Office air concentration µg/m³	Limit value LEED CI 2.1 /1/4 CREL µg/m³
$TVOC_{SumVOC}$ (C_6-C_{16})				190	7.5	-
$TVOC_{Toluene}$ (C_6-C_{16})				90	3.6	250
Single VOC Substance:						
4-Phenylcyclohexene	4994-16-5	-	1	< 2	< 0.2	3.25
iso-Butanol (2-Methyl-1-propanol) *	78-83-1	2.47	1	22	0.9	-
1-Butanol	71-36-3	2.71	1	25	1.0	-
Pentanal *	110-62-3	2.97	1	5.2	0.2	-
Hexanal *	66-25-1	4.71	1	22	0.9	-
Sum of Octanal * and Hexanoic acid	124-13-0 142-62-1	9.28-9.39	1	3.6	0.1	-
Sum not identified C10-C16	-	9.5-16.3	4	4.1	0.2	-
Sum of C10-Aromatics	-	10.2-1.6	3	2.0	0.1	-
Volatile Aldehydes						
Formaldehyde	50-00-0	-	1	57	2.3	30 (25 ppb)
Acetaldehyde	75-07-0	-	1	2.0	0.1	-
Total Aldehydes (other)	-	-	-	< 30	< 2	50 ppb

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)

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

Compounds marked with “not identified” are compounds not listed on the CREL list.

The results are only valid for the tested sample(s).
This report may only be copied or reprinted in its entity, parts of it only with a written acceptance by Eurofins Product Testing A/S.

3 Interpretation of the results

The results of 40/4 Veneer can be summarised as follows:

- The Total VOC was **below** the classification threshold of 0.25 mg/m³.
- The 4-Phenylcyclohexene concentration was **below** the classification threshold of 0.00325 mg/m³.
- The formaldehyde concentration was **below** the classification threshold of 25 ppb.
- The total aldehyde concentration was **below** the classification threshold of 50 ppb.

The tested product 40/4 Veneer complies with the requirements ANSI/BIFMA M7.1-2007 and the limit values given in ANSI/BIFMA X7.1-2007 for seating.

The model room concentrations were **below** the respective 1/4 CREL values.

The results are only valid for the tested sample(s).
This report may only be copied or reprinted in its entity, parts of it only with a written acceptance by Eurofins Product Testing A/S.

Appendix 1: Photo of the sample

The results are only valid for the tested sample(s).
This report may only be copied or reprinted in its entity, parts of it only with a written acceptance by Eurofins Product Testing A/S.