

Test Report

Revision 1

Report Number:
960806-1-M71 rev. 1



**DANISH
TECHNOLOGICAL
INSTITUTE**

Gregersensvej 1
DK-2630 Taastrup
+45 72 20 20 00
info@teknologisk.dk
www.teknologisk.dk

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Init.: HBK/MORM
Order no.: 960806
Encl.: 4

Assignor: HOWE PL Sp. z. o. o., ul. Wyspianskiego 26B/5 , PL 60-751 Poznan, Poland

Material: Table top MDF, oak veneer, no edge
Additional information is given in enclosure A.

Sampling: The assignor confirms having selected the product on 31 March 2021. The product was forwarded by the assignor and received at Danish Technological Institute on 8 April 2021.

Period: The test took place from 12 April 2021 to 10 December 2021.

Method: ANSI/BIFMA M7.1-2011(R2016), Standard Test Method for Determining VOC Emissions From Office Furniture Systems, Components and Seating
Additional information is given in enclosure B.

Test results: The results are shown in detail in enclosure C and D.

Remarks: This report replaces Report no. 960806-1-M71 of 25 May 2021. The report is updated with evaluation of compliance according to ANSI/BIFMA e3 in Enclosure D.

Terms: This test was conducted accredited in accordance with international requirements (ISO/IEC 17025:2017) and in accordance with the General Terms and Conditions of Danish Technological Institute. The test results solely apply to the tested item. This test report may be quoted in extract only if Danish Technological Institute has granted its written consent.

Place: Danish Technological Institute, Taastrup, Building and Construction

Signature: This document is only valid with a digital signature from Danish Technological Institute.
Date of issue 10 December 2021.

Helene Bendstrup Klinke
Business Manager



DIGITALLY SIGNED DOCUMENT

10 December 2021

DANISH TECHNOLOGICAL INSTITUTE



DANAK

TEST Reg.no. 2



Material identification

Chain of Custody form (CoC)

ANSI BIFMA M7.1/CDPH VOC test


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Manufacturer details	
Company	HOWE PL Sp. Z.o.o.
Address	Ul. Wyspianskiego 26B/5 PL 60-751
Country	Poland
Contact name	Monika Wawrzyn
Contact title	Quality, Environment and Sustainability Manager
Phone	+48 604 958 446
E-mail	mw@howe.com

 Copenhagen
 DK-2630 Taastrup
 Tel: +45 72 20 20 00
 Fax: +45 72 20 20 19
 info@dti.dk
 www.dti.dk

Sample details	
Sample ID	
Product category	Table top veneer
Product name	Table top MDF, oak veneer, no edge
Manufacturers ID. no.	301152003
Date manufactured	2021-03-31
Sample collection location	UAB Svenheim, Naujoji g. 132, Alytus 62175
Samples collection time and date	2021-03-31, 14.50
Sample collected by	Rolandas Adžgauskas
Number of sample pieces	1
Disposal of sample material after test:	<input checked="" type="checkbox"/> Scrap/discard <input type="checkbox"/> Storage and pick-up

Shipping details	
Packed by	UAB Svenheim
Shipping date	2021-03-31
Carrier	TNT Fexed
Reference number	8-315-76035

IMPORTANT:

Please wrap samples in airtight plastic in protective cardboard box/pallet and enclose this chain of custody form. Samples must be received at the test laboratory no later than 15 days from production.

Shipping address:

Danish Technological Institute
 Gregersensvej, Port 3K
 DK-2630 Taastrup
 Attn. Helene Klinke - Phone + 4572202173

Send electronic copy of test order form to: E-lab@dti.dk

Test laboratory	
Reception date & initials	08-04-2021 MHON
Laboratory ID	960806-1



Product description and material information from manufacturer

Table top, veneer on MDF	
Tested product:	Table top, MDF plate, oak veneer finish, open edges
Material information of the tested product:	Inner plate: MDF plate FSC 25mm MDF (Arrived 2021.03.01) Supplier: "UNILIN" Top veneer layers material: oak veneer (Arrived 2021.03.02) Supplier: "R.Ulrich" Glue used: Prefere 5220 (Prod. Date 2020.12.08) + Prefere 4131 (Prod. Date 2021.02.05) Supplier "Dynea AS" Top layers lacquer: Uvett Seal UL1369 (Prod. Date 2021.01.22) Uvett Seal UL1369 (Prod. Date 2021.02.08) Uvett Seal UL1384 (Prod. Date 2021.01.13) Uvett Clear 5 UM1178-0005BF (Prod. Date 2020.11.09) Uvett Clear 5 UM1178-0005BF (Prod. Date 2020.11.09) Supplier: "Sherwin-Williams" Any other materials, chemicals used during production: none
The tested product represents:	Table tops with oak veneer finish on MDF plates
Material information of the tested product series:	Same as for tested product
Name of manufacturer:	Svenheim
Date of issue:	2021-03-31



Emission testing

Material: Table top MDF, oak veneer, no edge

Additional test methods:

- ANSI/BIFMA X7.1-2011 Standard for Formaldehyde and TVOC Emissions of Low-emitting Office Furniture and Seating
- ANSI/BIFMA e3:2019 Furniture Sustainability Standard
- ISO 16000-6:2011 Indoor air - Part 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
- ISO 16000-3:2011 Indoor air - Part 3: Determination of formaldehyde and other carbonyl compounds - Active sampling method
- CDPH 01350 Ver 1.2 2017 Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions From Indoor Sources Using Environmental Chambers
- LEED v4.1. 2021 Interior design and construction

Sample handling:

Prior to testing the wrapped sample was stored at the test laboratory at 20-25 °C.
The sample was unpacked on 2021-04-12 at 14:00.

Photo of the test material in the chamber:



Climate chamber testing from 2021-04-12 to 2021-04-19

Climate chamber:	113 I - Polished stainless steel
Temperature:	23°C ± 1°C
Relative humidity:	50 % RH ± 5 % RH
Air velocity at the surface of the specimen:	0.1 – 0.3 m/s
Air change (n):	1.0 h ⁻¹ ± 0.05 h ⁻¹
Material load (L):	1.0 m ² /m ³
Area specific air flow rate (q):	1.0 m ³ /m ² h



Air sampling and analysis

Air samples were taken from the climate chamber outlet air with calibrated pumps, according to the following methods:

Compounds	Method	Absorbent	Sampling volume	Quantification/Analysis method	Detection limit
VOC and carcinogens	ISO 16000-6	Tenax	2-5 L	TDS-GC/MS Calibrated with pure reference standards	1 µg/m ³
Formaldehyde and carbonyls	ISO 16000-3	DNPH coated silica gel	60 L	HPLC-DAD Calibrated with pure reference standards	1 µg/m ³

Analysis of the air sampled on Tenax was performed at the Wilhelm Klaudivt Institut (WKI) under DAkkS accreditation number D-PL-11140-05-02. Report no. MAIC-2021-1287.

Analysis of the air sampled on DNPH was performed at the Danish Technological Institute under DANAK accreditation 90. Report no. 976595.



Results

Emission of volatile organic compounds

Material: Table top MDF, oak veneer, no edge

For the applied test conditions, the measured concentrations are equal to the emission factor (E).

The traditional concentration approach (ANSI/BIFMA M7.1 sect. 11.4.1) was applied for emission testing.

*ISO 16000-6 - Volatile organic compounds (VOC)**

Table 1: Emissions of VOC ($\mu\text{g}/\text{m}^3$)

Chemical class/compound name	CAS No.	72 hrs (3 days)				168 hrs (7 days)			
		#1	#2	Mean	% diff	#1	#2	Mean	% diff
Aromatic hydrocarbons									
Toluene		2	< 2	1	>100	3	3	3	0
Phenol	000108-95-2	< 2	2	1	>100	< 2	< 2	0	0
Aliphatic hydrocarbons									
Methylcyclopentane	000096-37-7	2	< 2	1	>100	< 2	< 2	0	0
Methylcyclohexane	000108-87-2	4	3	4	29	< 2	< 2	0	0
Cycloalkanes									
		< 2	< 2	< 2	0	< 2	< 2	< 2	0
Terpenes									
alpha-Pinene	000080-56-8	2	2	2	0	2	2	2	0
Alcohols									
		< 2	< 2	< 2	0	< 2	< 2	< 2	0
Glycols/Glycol ethers									
		< 2	< 2	< 2	0	< 2	< 2	< 2	0
Aldehydes									
Pentanal	000110-62-3	4	4	4	0	4	4	4	0
n-Hexanal	000066-25-1	7	7	7	0	8	8	8	0
Benzaldehyde	000100-52-7	12	13	13	8	10	9	10	11
Ketones									
Cyclohexanone	000108-94-1	14	13	14	7	7	6	7	15
Acetophenone	000098-86-2	3	3	3	0	< 2	< 2	0	0
Halocarbons									
		< 2	< 2	< 2	0	< 2	< 2	< 2	0
Acids									
Acetic acid	000064-19-7	29	22	26	27	14	14	14	0
Benzoic acid	000065-85-0	3	11	7	>100	3	3	3	0
Esters									
Mandelic acid methyl ester	020698-91-3	3	4	4	29	2	2	2	0
Methyl benzoylformate (Darocur MBF)	015206-55-0	4	4	4	0	2	2	2	0
Carboxylic acid ester (Methyl dodecanoate)		5	7	6	33	4	4	4	0

cont.



Chemical class/compound name	CAS No.	72 hrs (3 days)				168 hrs (7 days)			
		#1	#2	Mean	% diff	#1	#2	Mean	% diff
Dipropylene glycol diacrylate	057472-68-1	2	3	3	40	< 2	< 2	0	0
Others									
Dimethylsulfoxide	000067-68-5	2	3	3	40	2	2	2	0
Sums									
TVOC Toluene (ISO 16000-6)		130	99	115	27	67	60	64	11
Sum VOC (C6-C16)		98	101	100	3	61	59	60	3

*This substance may be Tenax degradation fragments.

* Single compounds/volatile compounds were quantified with pure reference standards, and in some cases the compounds shown in subscript were used for the quantification. Acetic acid concentrations have higher analytical uncertainty and may be underestimated, since the applied method is not optimal for this compound.

< 2 Not found above reporting limit < 2 µg/m³.

Measured concentrations near limit of quantification (LOQ) of approx. 1 µg/m³ will result in higher standard deviation from mean value.

Definitions according to ISO 16000-6:

VOC (C6-C16): Volatile organic compounds, between hexane (C6) and hexadecane (C16).

VOC (<C6): Very volatile organic compounds, eluting before hexane, not included in TVOC.

SVOC (>C16): Semi-volatile organic compounds, eluting after hexadecane, not included in TVOC.

TVOC: Total volatile organic compounds is the sum of all VOCs eluting between C6 and C16, quantified as toluene equivalents.

ISO 16000-3 - WVOC aldehydes

Table 2: Emissions of formaldehyde and carbonyls (µg/m³)

Chemical class/compound name	CAS No.	72 hrs (3 days)				168 hrs (7 days)			
		#1	#2	Mean	% diff	#1	#2	Mean	% diff
Formaldehyde	000050-00-0	9	9	9	0	7	7	7	0
Acetaldehyde	000075-07-0	4	4	4	0	3	3	3	0
Propanal	000123-38-6	< 2	< 2	< 2	0	< 2	< 2	< 2	0
Butanal	000123-72-8	< 2	< 2	< 2	0	< 2	< 2	< 2	0
Acrolein	000107-02-8	< 3	< 3	< 3	0	< 3	< 3	< 3	0

< 2 or < 3 Not found above reporting limit < 2 µg/m³ or < 3 µg/m³.

Measured concentrations near limit of quantification (LOQ) of approx. 1 µg/m³ will result in higher standard deviation from mean value.



Evaluation of results

According to ANSI/BIFMA M7.1 Table A1.2 and ANSI/BIFMA X7.1 Standard for Formaldehyde and TVOC Emissions from Low-emitting Office Furniture and Seating Table A1.2, the evaluation of indoor air concentrations from individual furniture components must meet the criteria limits for giving LEED EQ Credit for Low-Emitting Materials, Systems Furniture and Seating. The results are shown in Table 5.

Table 3: VOC emissions of tested sample after 168 hours

	Emission factor (E) of Tested Component	Maximum E Furniture Components* (Open Plan WS)	Maximum E Furniture Components* (Private Office WS)
Formaldehyde ($\mu\text{g}/\text{m}^2\text{h}$)	7.0	≤ 42.3	≤ 85.1
TVOC _(toluene) ($\mu\text{g}/\text{m}^2\text{h}$)	64	≤ 345	≤ 694
Total aldehydes ($\mu\text{mol}/\text{m}^2\text{h}$)	0.5	≤ 2.8	≤ 5.7
4-Phenylcyclohexene ($\mu\text{g}/\text{m}^2\text{h}$)	< 2.0	≤ 4.5	≤ 9.0

* ANSI/BIFMA M7.1 Table A1.2.



Table 4: Estimated concentrations (emission factor) of tested product at 3, 7 and 14 days of target CREL VOCs from Proposition 65 and Table 4-1 in CDPH 01350*.

Please note: The area specific emission rate (in $\mu\text{g}/\text{m}^2\text{h}$) must be converted to building concentration (in $\mu\text{g}/\text{m}^3$) dependent on the material load of the finished product, before comparison with the allowable concentration.

Compound name	CAS No.	C _(3 d) ($\mu\text{g}/\text{m}^2\text{h}$)	C _(7 d) ($\mu\text{g}/\text{m}^2\text{h}$)	C _(14 d) ($\mu\text{g}/\text{m}^2\text{h}$)	Allowable C _(14 d) ** ($\mu\text{g}/\text{m}^3$)
Acetaldehyde	000075-07-0	4	3	3	70
Benzene	000071-43-2	-	-	-	2
Carbon disulfide	000075-15-0	-	-	-	400
Carbon tetrachloride	000056-23-5	-	-	-	20
Chlorobenzene	000108-90-7	-	-	-	500
Chloroform	000067-66-3	-	-	-	150
Dichlorobenzene (1.4-)	000106-46-7	-	-	-	400
Dichloroethylene (1.1)	000075-35-4	-	-	-	35
Dimethylformamide (N.N-)	000068-12-2	-	-	-	40
Dioxane (1.4-)	000123-91-1	-	-	-	1500
Epichlorohydrin	000106-89-8	-	-	-	2
Ethylbenzene	000100-41-4	-	-	-	1000
Ethylene glycol	000107-21-1	-	-	-	200
Ethylene glycol monoethyl ether	000110-80-5	-	-	-	35
Ethylene glycol monoethyl ether acetate	000111-15-9	-	-	-	150
Ethylene glycol monomethyl ether	000109-86-4	-	-	-	30
Ethylene glycol monomethyl ether acetate	000110-49-6	-	-	-	45
Formaldehyde	000050-00-0	9	7	5	9
Hexane (n-)	000110-54-3	-	-	-	3500
Isophorone	000078-59-1	-	-	-	1000
Isopropanol	000067-63-0	-	-	-	3500
Methyl chloroform	000071-55-6	-	-	-	500
Methylene chloride	001634-04-4	-	-	-	200
Methyl t-butyl ether	000075-09-2	-	-	-	4000
Naphthalene	000091-20-3	-	-	-	5
Phenol	000108-95-2	< 2	< 2	< 2	100
Propylene glycol monomethyl ether	000107-98-2	-	-	-	3500
Styrene	000100-42-5	-	-	-	450
Tetrachloroethylene	000127-18-4	-	-	-	18
Toluene	000108-88-3	< 2	3	3	150
Trichloroethylene	000079-01-6	-	-	-	300
Vinyl acetate	000108-05-4	-	-	-	100
Xylenes, technical mixture (o.m.p)	000095-47-6 etc.	-	-	-	350

- Not detected

* CDPH 01350 (2017) Standard method for the testing and evaluation of volatile organic chemical emissions from indoor sources using environmental chambers. Version 1.2.

** All maximum allowable concentrations are one-half the corresponding CREL adopted by Office of Environmental Health Hazard Assessment (OEHHA) agency of California Environmental Protection Agency (CalEPA).



Table 5: Results of tested product with individual volatile organic chemical (VOC) concentration limits according to ANSI/BIFMA e3-2019. Section 7.6.2 Annex C.

Compound name	CAS No.	C _(14 d) (µg/m ³ h)	Open plan maximum allowable emission factor (µg/m ³ h)	Private office maximum allowable emission factor (µg/m ³ h)
Ethylbenzene	000100-41-4	-	689	1392
Styrene	000100-42-5	-	310	627
1,4-Dichlorobenzene	000106-46-7	-	276	557
Epichlorohydrin	000106-89-8	-	1	2.1
Ethylene Glycol	000107-21-1	-	138	278
1-Methoxy-2-propanol (Propylene glycol monomethyl ether)	000107-98-2	-	2413	4874
Vinyl Acetate	000108-05-4	-	68.9	139
Toluene	000108-88-3	3	103	209
Chlorobenzene	000108-90-7	-	345	696
Phenol	000108-95-2	< 2	68.9	139
2-Methoxyethanol	000109-86-4	-	21	42
Ethylene glycol monomethyl ether acetate	000110-49-6	-	31	63
n-Hexane	000110-54-3	-	2413	4874
2-Ethoxyethanol	000110-80-5	-	24	49
2-Ethoxyethylacetate	000111-15-9	-	103	209
1,4-Dioxane	000123-91-1	-	1034	2089
Tetrachloroethylene	000127-18-4	-	12.1	24.4
Formaldehyde	000050-00-0	5	11	23
Isopropanol	000067-63-0	-	2413	4874
Chloroform	000067-66-3	-	103	209
N,N-Dimethyl Formamide	000068-12-2	-	28	56
Benzene	000071-43-2	-	1	2.1
1,1,1-Trichloroethane	000071-55-6	-	345	696
Acetaldehyde	000075-07-0	3	48	97
Methylene Chloride	000075-09-2	-	138	278
Carbon Disulfide	000075-15-0	-	276	557
Trichloroethylene	000079-01-6	-	207	418
1-Methyl-2- Pyrrolidinone	000872-50-4	-	110	223
Naphthalene	000091-20-3	-	3	6
Xylenes (m-,o-, p-Xylene combined) etc.	000095-47-6 etc.	-	241	487

- Not detected



Table 6: Compliance of tested product according to ANSI/BIFMA e3-2019 Furniture Sustainability Standard. Section 7.6 Low Emitting Furniture.

Acceptance criteria	Parameter	Evaluation Open plan office (Pass/Fail)	Evaluation Private office (Pass/fail)
Section 7.6.1 – Prerequisite	TVOC, formaldehyde, total aldehydes, 4-PCH	Pass	Pass
Section 7.6.2 - Intermediate	Individual VOC list annex 3.	Pass	Pass
Section 7.6.3 – Advanced	Formaldehyde	Pass	Pass