

WOODS AND WOOD / TOCKKY TEST REPORT

SCOPE OF WORK

Standard Method Version 1.2 for CDPH 01350 on Tockky LQ-26 Light Gray

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SECTION 1

CLIENT INFORMATION

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SECTION 2

SUMMARY AND CONCLUSION

Test Method: Standard Method Version 1.2 for CDPH 01350
 Modeling Scenario: Private office (PO), school classroom (SC) and single family residence (R)
 Method Deviations: Testing performed without deviation unless noted below.

DESCRIPTION OF SAMPLES

Manufacturer / Location: Tockky LLC subsidiary of Woods&Wood LLC / USA
 Product Name: Tockky LQ-26 Light Gray
 Product Number: Acoustic Panel Felt
 Date of Manufacture: 07-June-2019
 Date of Collection: 07-June-2019
 Date of Shipment: 21-June-2019
 Date Received by Lab: 25-June-2019
 Date of Test Start and Duration: 05-July-2019 / 336 Hours
 As Received Sample Condition: Good Condition
 Lab Sample ID: GRR1906250004

WORK REQUESTED/APPLICABLE DOCUMENTS

VOC Emissions Analysis: CDPH Standard Method v1.2
 Intertek Quote: Qu-00987916

TEST RESULTS

MODELING SCENARIO	RESULT (PASS/FAIL)	TVOC (mg m ⁻³)
Private Office (PO)	PASS	0.1
School Classroom (SC)	PASS	< 0.1
Single Family Residence (R)*	PASS	0.4

*Note: The single family residence scenario is not yet a CDPH requirement. It is provided for informational purposes only.

SAMPLE DISPOSITION

At the completion of testing, samples were disposed of in a routine manner.

SECTION 3**CDPH STANDARD METHOD V1.2**

Date Received: 25-June-2019
Dates Tested: 05-July-2019 to 19-July-2019

DESCRIPTION OF SAMPLES:

Part Description: Tockky Felt Acoustic Panel – Light Gray
Material Submitted: One (1) Panel of 100% Polyester/PET

ACCEPTANCE CRITERIA:

Referencing: CDPH Standard Method v1.2, Table 4.1
LEED v4 - Low Emitting Materials
LEED v4 - TVOC Ranges: $\leq 0.5 \text{ mg m}^{-3}$
 $0.5 \text{ to } 5.0 \text{ mg m}^{-3}$
 $\geq 5.0 \text{ mg m}^{-3}$

TEST NOTES OR DEVIATIONS:

Testing performed without deviation unless noted below. The sample was not shipped within 24-hours of sample collection. The acetaldehyde blank value was above $2 \mu\text{g m}^{-3}$, this is not expected to have an effect on testing.

TEST SUMMARY:

The emissions testing was performed according to "Standard Method for the Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers Version 1.2". A photograph of the tested sample is included herein. The sample was taped on the edges and placed into the test chamber with top and bottom surfaces exposed. Air samples were collected prior to the sample being placed in the test chamber (0 hours) and at 264, 288, and 336 hours after being placed in the test chamber. Samples analyzed for individual VOCs and TVOC were collected on multi-sorbent tubes containing glass wool, Tenax TA 35/60 and Carbograph 5 TD 40/60. These VOC samples were analyzed by thermal desorption-gas chromatography/mass-spectrometry, TD-GC/MS. TVOC was calculated through integration of the chromatogram from n-pentane through n-heptadecane using toluene as a surrogate. Individual VOCs were calculated using calibration curves based on pure standards unless otherwise noted. Samples analyzed for low molecular weight aldehydes were collected on cartridges treated with 2,4-di-nitrophenylhydrazine (DNPH). Low molecular weight aldehydes were analyzed using high performance liquid chromatography, HPLC.

RESULTS:

Table 1: Sample and Chamber Conditions during Test Period

PARAMETER		SYMBOL	VALUE	UNITS
Sample Dimensions	Length	-	0.230	m
	Width	-	0.230	m
	Thickness	-	-	m
Exposed Sample Surface Area		<i>A</i>	0.053	m ²
Chamber Volume		<i>V</i>	0.116	m ³
Chamber Loading Factor		<i>L</i>	0.46	m ² m ⁻³
Inlet Air Flow Rate		<i>Q</i>	0.116	m ³ h ⁻¹
Air Change Rate		<i>N_{ACH}</i>	1.00	h ⁻¹
Area Specific Flow Rate		<i>q_A</i>	2.19	m h ⁻¹
Chamber Pressure (Range)		<i>P</i>	16.4 (14.8-18.3)	Pa
Average Temperature (Range)		<i>T</i>	22.5 (22.2-22.8)	°C
Average Humidity (Range)		RH	50.0 (49.3-51.0)	% RH
Testing Duration		<i>t</i>	336	h

Table 2: Test chamber background VOC concentrations in µg m⁻³.

COMPOUND	CAS No.	<i>C_{io}</i>
Formaldehyde	50-00-0	1.6
TVOC	-	15.5

Table 3: Test chamber TVOC and formaldehyde concentrations in µg m⁻³.

COMPOUND	CAS No.	264 H	288 H	336 H
Formaldehyde	50-00-0	< 2.0	< 2.0	< 2.0
TVOC	-	59.7	50.3	52.4

Table 4: Test chamber TVOC and formaldehyde emission factors in µg m⁻² h⁻¹.

COMPOUND	CAS No.	264 H	288 H	336 H
Formaldehyde	50-00-0	< 4.4	< 4.4	< 4.4
TVOC	-	96.6	76.0	80.6

Individual emitted VOCs identified above the lower limits of quantitation are listed in Table 5; VOCs which are listed on chemical of concern lists or have CRELs are indicated.

The measured chamber concentrations and corresponding emission factors of identified individual VOCs and TVOCs are listed in Table 6.

In Tables 4, 6 and 7, emission factors were calculated using equation 3.1 in CDPH Standard Method V1.2:

$$EF_{Ai} = \frac{Q \times (C_{it} - C_{i0})}{A_c}$$

The inlet flow rate, Q ($m^3 h^{-1}$), is the measured flow rate of air into the chamber. The chamber concentration, C_{it} ($\mu g m^{-3}$), is the concentration of a target VOC_{*i*}, formaldehyde and other carbonyl compounds measured at time t . The chamber background concentration, C_{i0} ($\mu g m^{-3}$), is the corresponding concentration measured with the chamber operating without a test specimen. The exposed surface area of the test specimen in the chamber, A_c (m^2), is determined from the measurements made at the time of specimen preparation.

Table 5: VOCs detected above lower limits of quantitation in air samples at 336 hours.

VOC	CAS No.	SURROGATE ¹	CREL ² ($\mu g m^{-3}$)	CARB TAC ³	PROP 65 LIST ⁴
Acetaldehyde	75-07-0		140	Yes	Yes
Phenol	108-95-2		200	Yes	No
Unknown	-	X	-	-	-
Butylated Hydroxytoluene	128-37-0	X	-	No	No

¹Indicates which non-listed VOCs were quantified using surrogate compounds, all other compounds were quantified using pure compounds.

²Chronic Reference Exposure Level (CREL) as defined by California Office of Environmental Health Hazard Assessment.

³Substance is listed on California Air Resource Board’s (CARB) Toxic Air Contaminant (TAC) identification list.

⁴Substance known to the state of California to cause cancer or reproductive toxicity according to California’s Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65).

Table 6: Measured chamber concentrations and corresponding emission factors of individual VOCs listed in Table 4-1 of CDPH 01350 V1.2. at 336 hours.

VOC	CAS No.	CHAMBER CONCENTRATION ($\mu\text{g m}^{-3}$)	EMISSION FACTOR ($\mu\text{g m}^{-2} \text{h}^{-1}$)
Formaldehyde	50-00-0	< 2.0	< 4.4
Acetaldehyde	75-07-0	2.1	< 3.2
Vinyl acetate	108-05-4	< 0.8	< 1.7
Epichlorohydrin	106-89-8	< 0.3	< 0.7
Ethanol, 2-methoxy-, acetate	110-49-6	< 0.5	< 1.2
Isopropyl Alcohol	67-63-0	< 0.2	< 0.4
Ethene, 1,1-dichloro-	75-35-4	< 0.3	< 0.7
Methylene chloride	75-09-2	< 0.2	< 0.4
Carbon disulfide	75-15-0	< 0.3	< 0.6
Methyl tert-butyl ether	1634-04-4	< 0.7	< 1.6
n-Hexane	110-54-3	< 0.2	< 0.4
Trichloromethane (Chloroform)	67-66-3	< 0.1	< 0.3
Ethanol, 2-methoxy-	109-86-4	< 0.4	< 0.9
Ethane, 1,1,1-trichloro-	71-55-6	< 0.2	< 0.5
Benzene	71-43-2	< 0.2	< 0.5
Carbon Tetrachloride	56-23-5	< 0.1	< 0.3
2-Propanol, 1-methoxy-	107-98-2	< 0.2	< 0.5
Ethylene glycol	107-21-1	< 30	< 65.7
Trichloroethylene	79-01-6	< 0.1	< 0.1
1,4-Dioxane	123-91-1	< 0.1	< 0.2
Ethanol, 2-ethoxy-	110-80-5	< 0.3	< 0.7
Toluene	108-88-3	< 0.1	< 0.2
Formamide, N,N-dimethyl-	68-12-2	< 0.3	< 0.7
Tetrachloroethylene	127-18-4	< 0.1	< 0.1
Benzene, chloro-	108-90-7	< 0.1	< 0.1
Ethylbenzene	100-41-4	< 0.1	< 0.1
Xylene (-m, -p, & -o)	108-38-3, 95-47-6, 106-42-3	< 0.1	< 0.3
Styrene	100-42-5	< 0.1	< 0.3
2-Ethoxyethyl acetate	111-15-9	< 0.4	< 0.8
Phenol	108-95-2	2.3	5
Benzene, 1,4-dichloro-	106-46-7	< 0.1	< 0.3
Isophorone	78-59-1	< 0.4	< 0.8
Naphthalene	91-20-3	< 0.2	< 0.4

Table 7: Measured chamber concentrations and corresponding emission factors of identified individual VOCs and TVOC at 336 hours.

VOC	CAS No.	CHAMBER CONCENTRATION ($\mu\text{g m}^{-3}$)	EMISSION FACTOR ($\mu\text{g m}^{-2} \text{h}^{-1}$)
Unknown	-	5.8	12.8
Butylated Hydroxytoluene	128-37-0	32.3	70.6
TVOC	-	52.4	80.6

Exposure Scenario Modeling and Evaluation:

Estimated building concentrations for the listed scenarios were calculated using equation 3.2a of CDPH Standard Method V1.2:

$$C_{Bi} = \frac{EF_{Ai} \times A_B}{Q_B}$$

The area specific emission rate EF_A at 336 hours (14 days) total exposure time is multiplied by the ratio of the exposed surface area of the installed material in the building, A_B (m^2), to the flow rate of outside ventilation air, Q_B ($\text{m}^3 \text{h}^{-1}$).

The modeling parameters used for the given scenarios are listed in Table 8. The modeled concentrations of identified individual VOCs are listed in Tables 9 & 10. Whether the modeled concentrations meet the maximum allowable concentration requirements specified in Table 4.1 of CDPH Standard Method V1.2 are also indicated.

Table 8: Standard modeling parameters for wall covering.

PARAMETER	SYMBOL	VALUE	UNITS
Exposed Surface Area Installed in <i>Private Office (PO)</i>	A_B	33.4	m^2
Air flow rate of <i>Private Office (PO)</i>	Q_B	20.7	$\text{m}^3 \text{h}^{-1}$
Exposed Surface Area Installed in <i>Classroom (SC)</i>	A_B	94.6	m^2
Air flow rate of <i>Classroom (SC)</i>	Q_B	191	$\text{m}^3 \text{h}^{-1}$
Exposed Surface Area Installed in <i>Residence (R)</i>	A_B	562	m^2
Air flow rate of <i>Residence (R)</i>	Q_B	127	$\text{m}^3 \text{h}^{-1}$

Table 9: Modeled concentrations of individual VOCs specified in Table 4-1 of CDPH 01350 V1.2.

VOC	CAS NO.	MODELED CONCENTRATION ($\mu\text{g m}^{-3}$)			CONC. LIMIT ($\mu\text{g m}^{-3}$)	RESULT Pass (P) /Fail (F)		
		PO	SC	R		PO	SC	R
Formaldehyde	50-00-0	< 7.1	< 2.2	< 19.4*	9	P	P	P
Acetaldehyde	75-07-0	< 5.2	< 1.6	< 14.2	70	P	P	P
Vinyl acetate	108-05-4	< 2.7	< 0.8	< 7.5	100	P	P	P
Epichlorohydrin	106-89-8	< 1.1	< 0.3	< 3.1*	1.5	P	P	P
Ethanol, 2-methoxy-, acetate	110-49-6	< 1.9	< 0.6	< 5.2	45	P	P	P
Isopropyl Alcohol	67-63-0	< 0.7	< 0.2	< 1.8	3,500	P	P	P
Ethene, 1,1-dichloro-	75-35-4	< 1.1	< 0.3	< 2.9	35	P	P	P
Methylene chloride	75-09-2	< 0.6	< 0.2	< 1.7	200	P	P	P
Carbon disulfide	75-15-0	< 1.0	< 0.3	< 2.7	400	P	P	P
Methyl tert-butyl ether	1634-04-4	< 2.6	< 0.8	< 7.2	4,000	P	P	P
n-Hexane	110-54-3	< 0.7	< 0.2	< 1.8	3,500	P	P	P
Trichloromethane (Chloroform)	67-66-3	< 0.5	< 0.2	< 1.4	150	P	P	P
Ethanol, 2-methoxy-	109-86-4	< 1.4	< 0.4	< 3.8	30	P	P	P
Ethane, 1,1,1-trichloro-	71-55-6	< 0.7	< 0.2	< 2	500	P	P	P
Benzene	71-43-2	< 0.8	< 0.2	< 2.2*	1.5	P	P	P
Carbon Tetrachloride	56-23-5	< 0.5	< 0.1	< 1.3	20	P	P	P
2-Propanol, 1-methoxy-	107-98-2	< 0.7	< 0.2	< 2	3,500	P	P	P
Ethylene glycol	107-21-1	< 106	< 32.5	< 291*	200	P	P	P
Trichloroethylene	79-01-6	< 0.2	< 0.1	< 0.6	300	P	P	P
1,4-Dioxane	123-91-1	< 0.3	< 0.1	< 0.8	1,500	P	P	P
Ethanol, 2-ethoxy-	110-80-5	< 1.1	< 0.3	< 3	35	P	P	P
Toluene	108-88-3	< 0.2	< 0.1	< 0.7	150	P	P	P
Formamide, N,N-dimethyl-	68-12-2	< 1.1	< 0.3	< 3.1	40	P	P	P
Tetrachloroethylene	127-18-4	< 0.2	< 0.1	< 0.5	17.5	P	P	P
Benzene, chloro-	108-90-7	< 0.2	< 0.1	< 0.6	500	P	P	P
Ethylbenzene	100-41-4	< 0.2	< 0.1	< 0.6	1,000	P	P	P
Xylene (-m, -p, & -o)	108-38-3, 95-47-6, 106-42-3	< 0.5	< 0.1	< 1.3	350	P	P	P
Styrene	100-42-5	< 0.5	< 0.2	< 1.4	450	P	P	P
2-Ethoxyethyl acetate	111-15-9	< 1.3	< 0.4	< 3.6	150	P	P	P
Phenol	108-95-2	8.0	2.5	22.0	100	P	P	P
Benzene, 1,4-dichloro-	106-46-7	< 0.5	< 0.1	< 1.3	400	P	P	P
Isophorone	78-59-1	< 1.2	< 0.4	< 3.4	1,000	P	P	P
Naphthalene	91-20-3	< 0.6	< 0.2	< 1.6	4.5	P	P	P

*Individual VOC of concern is below lower LOQ for modeled scenario.

Table 10: Modeled concentrations of identified non-listed individual VOCs.

VOC	CAS NO.	MODELED CONCENTRATION ($\mu\text{g m}^{-3}$)			CONC. LIMIT ($\mu\text{g m}^{-3}$)	Result Pass (P) /Fail (F)		
		PO	SC	R		PO	SC	R
Unknown	-	20.6	6.3	56.4	-	-	-	-
Butylated Hydroxytoluene	128-37-0	114	35.0	312	-	-	-	-
TVOC _{Toluene}	-	130	39.9	357	-	-	-	-

PHOTOGRAPHS:

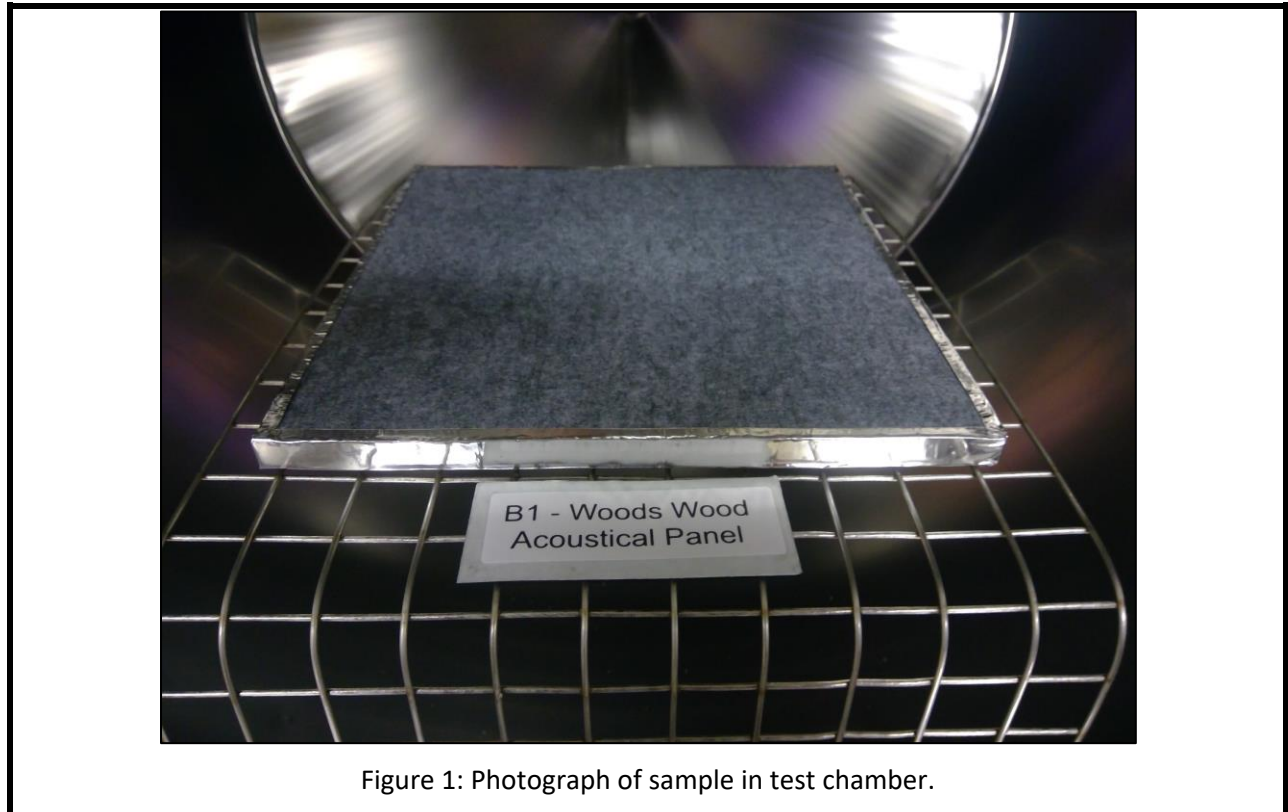


Figure 1: Photograph of sample in test chamber.

SECTION 4

FACILITIES AND EQUIPMENT:

GCMS

INSTRUMENTATION USED:	Markes TD-100 Thermal Desorption Agilent 7890A GC Agilent 5975C MS
COLUMN USED:	Agilent HP-Ultra 2 (GC)

HPLC

INSTRUMENTATION USED:	Agilent 1260 Infinity Series
COLUMN USED:	Poroshell 120 EC-C18