



Title: VOC Test Results

Product: 1" CFAB

Application: Acoustical Absorption

Testing Standard: CDPH Standard Method V1.2-2017

Test Date: October 12, 2018 to October 30, 2018

Why this test: This test identifies volatile organic compounds (VOCs), such as formaldehyde, released into the air by products. Samples are put into an environmental chamber and the air is tested at 11-, 12- and 14-days. VOC levels are then used to predict office and school room concentrations and then compared to maximum allowable levels.

Test Result Summary:

MODELING SCENARIO	RESULT (PASS/FAIL)	TVOC (mg m ⁻³)
Private Office (PO) - Ceiling	PASS	0.1
School Classroom (SC) - Ceiling	PASS	0.1

Test ID: 103632425GRR-002cr

ASI TEST RESULT DISCLAIMER

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ASI TEST REPORT

SCOPE OF WORK

Standard Method Version 1.2 for CDPH 01350 on CFAB

REPORT NUMBER

103632425GRR-002cr

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30-October-2018

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29-March-2019

PAGES

14

DOCUMENT CONTROL NUMBER

Per GFT-OP-10 (6-March-2017)

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TEST REPORT FOR ASI

Report No.: 103632425GRR-002cr

Date: 30-October-2018

P.O.: 00065831

Revision Date: 29-March-2019

SECTION 1

CLIENT INFORMATION

Attention: Conor Cook

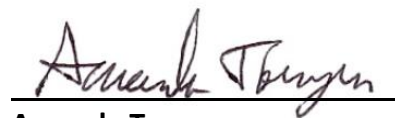
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SECTION 2

SUMMARY AND CONCLUSION

Test Method: Standard Method Version 1.2 for CDPH 01350
Modeling Scenario: Private office (PO) and school classroom (SC)
Method Deviations: Testing performed without deviation unless noted below. The formaldehyde and acetaldehyde blanks were above $2.0 \mu\text{g m}^{-3}$ there is not expected to be an effect on testing.

DESCRIPTION OF SAMPLES

Manufacturer / Location ASI / Chaska, MN
Product Name CFAB
Product Number Not Specified
Date of Manufacture 09-October-2018
Date of Collection 09-October-2018
Date of Shipment 09-October-2018
Date Received by Lab 10-October-2018
Date of Test Start and Duration 12-October-2018 / 336 hours
As Received Sample Condition Good Condition
Lab Sample ID GRR181010000A

WORK REQUESTED/APPLICABLE DOCUMENTS

VOC Emissions Analysis: CDPH Standard Method v1.2
Intertek Quote: Qu-00901125

TEST RESULTS

MODELING SCENARIO	RESULT (PASS/FAIL)	TVOC (mg m^{-3})
Private Office (PO) – Ceiling	PASS	0.1
School Classroom (SC) – Ceiling	PASS	0.1

SAMPLE DISPOSITION

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

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

Date Received: 10-October-2018

Dates Tested: 12-October-2018 to 26-October-2018

DESCRIPTION OF SAMPLES:

Part Description: Acoustical Panel for Absorption

Material Submitted: Four (4) Cellulose Insulation, PET, Recycled Cotton, and Inorganic Borates Panels

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.

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 cut to an appropriate size to achieve the desired loading factor. The edges were sealed with aluminized tape. The sample was placed in conditioning in the chamber for 10 days with top and bottom surfaces exposed, before testing was initiated. Air samples were collected prior to the sample being placed in the test chamber (0 hours) and at 264, 288, and 336 hours after placement 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-dinitrophenylhydrazine (DNPH). Low molecular weight aldehydes were analyzed using high performance liquid chromatography, HPLC.

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RESULTS:**Table 1: Sample and Chamber Conditions during Test Period**

PARAMETER		SYMBOL	VALUE	UNITS
Sample Dimensions	Length	-	0.240	m
	Width	-	0.240	m
	Thickness	-	-	m
Exposed Sample Surface Area		A	0.058	m^2
Chamber Volume		V	0.116	m^3
Chamber Loading Factor		L	0.50	$\text{m}^2 \text{m}^{-3}$
Inlet Air Flow Rate		Q	0.116	$\text{m}^3 \text{h}^{-1}$
Air Change Rate		N_{ACH}	1.00	h^{-1}
Area Specific Flow Rate		q_A	2.01	m h^{-1}
Chamber Pressure (Range)		P	19.0 (10.1-21.0)	Pa
Average Temperature (Range)		T	23.1 (22.6-23.7)	$^{\circ}\text{C}$
Average Humidity (Range)		RH	49.7 (47.3-51.1)	% RH
Testing Duration		t	336	h

Table 2: Test chamber background VOC concentrations in $\mu\text{g m}^{-3}$.

COMPOUND	CAS No.	C_{10}
Formaldehyde	50-00-0	2.5
TVOC	-	4.9

Table 3: Test chamber TVOC and formaldehyde concentrations in $\mu\text{g m}^{-3}$.

COMPOUND	CAS No.	264 H	288 H	336 H
Formaldehyde	50-00-0	2.8	2.1	2.3
TVOC	-	113	102	99.1

Table 4: Test chamber TVOC and formaldehyde emission factors in $\mu\text{g m}^{-2} \text{h}^{-1}$.

COMPOUND	CAS No.	264 H	288 H	336 H
Formaldehyde	50-00-0	0.6	*BB	*BB
TVOC	-	217	195	189

*BB – Below Blank

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Individual emitted VOCs identified above the lower limits of quantitation are listed in Table 7; 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 8.

In Tables 6, 8 and 9, emission factors were calculated using equation 3.1 in CDPH Standard Method V1.2:

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

The inlet flow rate, Q ($\text{m}^3 \text{h}^{-1}$), is the measured flow rate of air into the chamber. The chamber concentration, C_{it} ($\mu\text{g m}^{-3}$), is the concentration of a target VOC_i, formaldehyde and other carbonyl compounds measured at time t . The chamber background concentration, C_{io} ($\mu\text{g m}^{-3}$), is the corresponding concentration measured with the chamber operating without a test specimen. The exposed projected 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 ($\mu\text{g m}^{-3}$)	CARB TAC ³	PROP 65 LIST ⁴
Formaldehyde	50-00-0		9	Yes	Yes
Methylene chloride	75-09-2		400	Yes	Yes
Phenol	108-95-2		200	Yes	No
Butylated Hydroxytoluene	128-37-0	X	NA	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).

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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	< 0.8	< 1.5
Acetaldehyde	75-07-0	< 3.9	< 7.7
Vinyl acetate	108-05-4	< 2.5	< 5
Epichlorohydrin	106-89-8	< 2.5	< 5
Ethanol, 2-methoxy-, acetate	110-49-6	< 2.5	< 5
Isopropyl Alcohol	67-63-0	< 0.2	< 0.4
Ethene, 1,1-dichloro-	75-35-4	< 0.2	< 0.3
Methylene chloride	75-09-2	1.7	3.4
Carbon disulfide	75-15-0	< 0.5	< 1
Methyl tert-butyl ether	1634-04-4	< 0.5	< 1
n-Hexane	110-54-3	< 0.3	< 0.6
Trichloromethane (Chloroform)	67-66-3	< 0.3	< 0.6
Ethanol, 2-methoxy-	109-86-4	< 0.4	< 0.8
Ethane, 1,1,1-trichloro-	71-55-6	< 0.2	< 0.4
Benzene	71-43-2	< 0.3	< 0.5
Carbon Tetrachloride	56-23-5	< 0.2	< 0.4
2-Propanol, 1-methoxy-	107-98-2	< 0.2	< 0.5
Ethylene glycol	107-21-1	< 8	< 16.1
Trichloroethylene	79-01-6	< 0.2	< 0.3
1,4-Dioxane	123-91-1	< 0.2	< 0.3
Ethanol, 2-ethoxy-	110-80-5	< 0.4	< 0.8
Toluene	108-88-3	< 0.2	< 0.4
Formamide, N,N-dimethyl-	68-12-2	< 0.4	< 0.8
Tetrachloroethylene	127-18-4	< 0.2	< 0.4
Benzene, chloro-	108-90-7	< 0.2	< 0.4
Ethylbenzene	100-41-4	< 0.2	< 0.4
Xylene (-m, -p, & -o)	108-38-3, 95-47-6, 106-42-3	< 0.6	< 1.2
Styrene	100-42-5	< 0.1	< 0.3
2-Ethoxyethyl acetate	111-15-9	< 0.5	< 1
Phenol	108-95-2	38.7	77.8
Benzene, 1,4-dichloro-	106-46-7	< 0.1	< 0.3
Isophorone	78-59-1	< 0.2	< 0.3
Naphthalene	91-20-3	< 0.2	< 0.5

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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 ($\mu\text{g m}^{-2} \text{h}^{-1}$)
Butylated Hydroxytoluene	128-37-0	51.2	103
TVOC	-	99.1	189

Exposure Scenario Modeling and Evaluation:

Estimated building concentrations for the private office and school classroom 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 private office and school classroom scenarios are listed in Table 10.

The modeled concentrations of identified individual VOCs for private office and school classroom scenarios are listed in Tables 11 & 12. 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 ceiling.

PARAMETER	SYMBOL	VALUE	UNITS
Exposed Surface Area Installed in <i>Private Office (PO)</i>	A_B	11.10	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	89.2	m^2
Air flow rate of <i>Classroom (SC)</i>	Q_B	191	$\text{m}^3 \text{h}^{-1}$

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

VOC	CAS NO.	PROJECTED CONCENTRATION ($\mu\text{g m}^{-3}$)		CONC. LIMIT ($\mu\text{g m}^{-3}$)	RESULT Pass (P) /Fail (F)	
		PO	SC		PO	SC
Formaldehyde	50-00-0	< 0.8	< 0.7	9	P	P
Acetaldehyde	75-07-0	< 4.2	< 3.6	70	P	P
Vinyl acetate	108-05-4	< 2.7	< 2.3	100	P	P
Epichlorohydrin	106-89-8	< 2.7*	< 2.3*	1.5	P	P
Ethanol, 2-methoxy-, acetate	110-49-6	< 2.7	< 2.3	45	P	P
Isopropyl Alcohol	67-63-0	< 0.2	< 0.2	3,500	P	P
Ethene, 1,1-dichloro-	75-35-4	< 0.2	< 0.2	35	P	P
Methylene chloride	75-09-2	1.8	1.6	200	P	P
Carbon disulfide	75-15-0	< 0.5	< 0.5	400	P	P
Methyl tert-butyl ether	1634-04-4	< 0.5	< 0.5	4,000	P	P
n-Hexane	110-54-3	< 0.3	< 0.3	3,500	P	P
Trichloromethane (Chloroform)	67-66-3	< 0.3	< 0.3	150	P	P
Ethanol, 2-methoxy-	109-86-4	< 0.4	< 0.4	30	P	P
Ethane, 1,1,1-trichloro-	71-55-6	< 0.2	< 0.2	500	P	P
Benzene	71-43-2	< 0.3	< 0.2	1.5	P	P
Carbon Tetrachloride	56-23-5	< 0.2	< 0.2	20	P	P
2-Propanol, 1-methoxy-	107-98-2	< 0.2	< 0.2	3,500	P	P
Ethylene glycol	107-21-1	< 8.7	< 7.5	200	P	P
Trichloroethylene	79-01-6	< 0.2	< 0.2	300	P	P
1,4-Dioxane	123-91-1	< 0.2	< 0.2	1,500	P	P
Ethanol, 2-ethoxy-	110-80-5	< 0.4	< 0.4	35	P	P
Toluene	108-88-3	< 0.2	< 0.2	150	P	P
Formamide, N,N-dimethyl-	68-12-2	< 0.4	< 0.4	40	P	P
Tetrachloroethylene	127-18-4	< 0.2	< 0.2	17.5	P	P
Benzene, chloro-	108-90-7	< 0.2	< 0.2	500	P	P
Ethylbenzene	100-41-4	< 0.2	< 0.2	1,000	P	P
Xylene (-m, -p, & -o)	108-38-3, 95-47-6, 106-42-3	< 0.7	< 0.6	350	P	P
Styrene	100-42-5	< 0.1	< 0.1	450	P	P
2-Ethoxyethyl acetate	111-15-9	< 0.5	< 0.5	150	P	P
Phenol	108-95-2	41.7	36.3	100	P	P
Benzene, 1,4-dichloro-	106-46-7	< 0.1	< 0.1	400	P	P
Isophorone	78-59-1	< 0.2	< 0.1	1,000	P	P
Naphthalene	91-20-3	< 0.2	< 0.2	4.5	P	P

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

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

VOC	CAS NO.	PROJECTED CONCENTRATION ($\mu\text{g m}^{-3}$)		CONC. LIMIT ($\mu\text{g m}^{-3}$)	Result Pass (P) /Fail (F)	
		PO	SC		PO	SC
Butylated Hydroxytoluene	128-37-0	55.2	48.1	-	-	-
TVOC _{Toluene}	-	102	88.5	-	-	-

PHOTOGRAPHS:

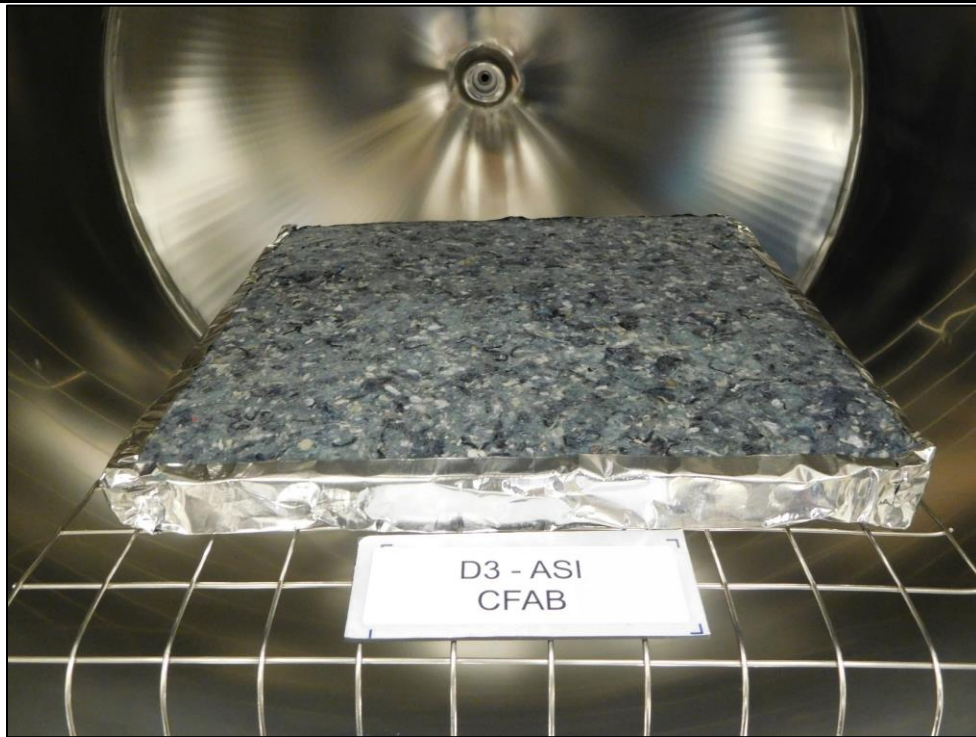


Figure 1: Photograph of sample in test chamber

SECTION 4

FACILITIES AND EQUIPMENT:

GCMS


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

HPLC

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

SECTION 5

CHAIN OF CUSTODY

 intertek Total Quality. Assured.	Ship To:		Chain of Custody for Chemical Testing	
	Attn: VOC Laboratory		Intertek Quotation Number: Qu-00901125	
	4700 Broadmoor SE Suite 200		Purchase Order (enter Company and Number): ASI 65831	
	Kentwood, MI 49512 Phone: 616-656-7401			
Customer Information				
Company: ASI				
Street Address: 123 Columbia Court N.				
City/State/Postal code: Chaska, MN 55318				
Country: USA				
Contact Name & Title (for reporting): Conor Cook, Resource Specialist				
Contact Phone/Fax Numbers: 952-466-8261				
Contact E-mail Address: ccook@acousticalsurfaces.com				
Financially Responsible Co.: Acoustical Surfaces Inc.				
Manufacturer Information (If Different)				
Company:				
City/State/Country:				
Contact Name/Title:				
Phone Number/E-mail Address:				
Sample Details				
Product Commercial Name*: CFAB™ Cellulose Panels				
Product Commercial Part No.(if not part of the name)*: N/A				
Manufacturer Sample Tracking ID: 01350V12-2				
Date Manufactured*: 10/9/2018				
Product Category & Use*: Acoustical Panel for absorption				
Sample Construction Materials*: Cellulose insulation, PET, Recycled Cotton, Inorganic Borates				
Plant Name & Location*: CMS - Jensen, M.I.				
Collection Location within Plant: CMS				
Date & Time Collected*: 9:38 am 10/9/2018				
Number of Sample Pieces*: 4				
Sample Collected by*: Maryjane Miedema				
Phone/Fax Numbers*: 616-669-2990				
E-mail Address*: mjmiedema@cmsgreen.com				
Requested Testing				
Test to be performed: CDPH 01350 V1.2				
Customer Request for Certification				
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ETL Environmental VOC+™ Certification: <input checked="" type="checkbox"/> YES				
SCS's Indoor Advantage™ Certification: <input type="checkbox"/> YES				
SCS's Indoor Advantage™ Gold Certification: <input type="checkbox"/> YES				
SCS's FloorScore® Certification: <input type="checkbox"/> YES				
Special Customer Instructions				
Customer Authorizes Laboratory to Submit Copies of Test Reports To:				
Contact:				
Email Address:				
Organization:				
Contact:				
Email Address:				
Organization:				
Intertek Use Only				
Condition of Shipping Package: Good				
Condition of Sample: Good				
Sample ID: GRR181010000A				
GIN: 6103632425				
Sample Handling*				
	Printed Name*	Signature*	Date*	Company*
Relinquished By:	Maryjane Miedema	Maryjane Miedema	10/9/2018	CMS
Received by:	Amanda Tonger	Amanda Tonger	10/10/18	Intertek

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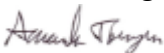
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SECTION 6**REVISIONS MADE TO TEST REPORT**

INDEX	DATE	REVISION DESCRIPTION	REVISED BY	REVIEWED BY
-002c	30-October-2018	Initial Release.	-	-
-002cr	29-March-2019	Update to ceiling modeling. Include only Office and Classroom Scenarios.	Amanda Tongen 	Jesse Ondersma 