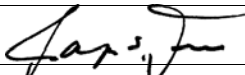


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VOC Emissions from Building Products

Customer & Product Sample Information

Report Certification	
Report number	314-002-01AA-Nov2410
Report date	Nov 24, 2010
Certified by (Name/Title)	Raja S. Tannous, Laboratory Director
Signature	
Date	November 24, 2010

Methods	
Test method	CA/DHS/EHLB/R-174 (Standard Practice [Sect. 01350])
Acceptance criteria	CA/DHS/EHLB/R-174 (Standard Practice, 14 days)
Modeling scenario	CA/DHS/EHLB/R-174 Standard Classroom

Customer Information	
Manufacturer or organization	Chatfield-Clarke Company, Inc.
City/State/Country	Fontana, CA USA
Contact name/Title	Kim Stowers, Sec-Terasurer
Phone number	909-823-4297

Product Sample Information*	
Manufacturer (if not customer)	Chatfield-Clarke Co.
Product name / Number	Vinyl Tackboard / Tackboard
Product CSI category	Tackboards (10 11 23)
Customer sample ID	not provided
Manufacturing Location	Fontana, CA
Date sample manufactured	Oct 27, 2010
Date sample collected	Oct 27, 2010
Date sample shipped	Oct 27, 2010
Date sample received by lab	Oct 29, 2010
Condition of received sample	No observed problems
Lab sample tracking number	314-002-01AA
Conditioning start date & duration	Nov 5, 2010; 10 days
Test start date and duration	Nov 15, 2010; 4 days (96 hours)

*Chain-of-custody (COC) form for product sample is attached to this report

Summary of Emission Test Results

VOC Emission Test Results – The pass/fail results of the test with respect to the procedures and acceptance criteria given in the CA DHS Standard Practice and the modeling scenario(s) from the Standard Practice detailed in Table 3 of this report are summarized in Table 1. These results are based on predicted indoor air concentrations of individual VOCs in the modeled scenario(s). The concentration limits are one half the noncancer Chronic Reference Exposure Levels (CRELs) established by California OEHHA for a list of toxic chemicals with the exception of formaldehyde, for which the guideline concentration is one-half the indoor REL of 33 µg/m³, i.e., 16.5 µg/m³ as described in the CA DHS Standard Practice and its Addendum 2004-01. Note that OEHHA published a new hazard assessment for acetaldehyde in December 2008, setting the CREL for this compound at 140 µg/m³. These test results are specific to the test item.

Table 1. Pass/Fail results based on the test method and identified modeling parameters. Only detected individual VOCs with CRELs are listed

Chemical	CAS No	½ CREL* (µg/m ³)	Predicted Classroom Concentration
Vinyl acetate	108-05-4	100	Pass

*See guideline for formaldehyde described above

Test Method for Building Products

Test Specimen Preparation – Cut to size and placed over stainless steel plate covering back surface and all edges. Photographs of the tested specimen are given in Appendix A. The test results presented herein are specific to this item.

Test Protocol Summary* – The emission test was performed following California Department of Health Services (CA DHS) “Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers” [CA/DHS/EHLB/R-174](#). Note: the Standard Practice derives from California Specification 01350 and frequently is referred to as “Section 01350.” Chemical sampling and analyses were performed following [U.S. EPA Compendium Methods TO-1 and TO-17](#) and [ASTM Standard Method D 5197-03](#). All four of these methods are included in Berkeley Analytical Associate’s scope of ISO/IEC 17025:2005 accreditation. The product specimen was prepared from the supplied product sample and was placed directly into the conditioning environment and maintained at controlled conditions of air flow rate, temperature and relative humidity for ten days as described in the Standard Practice. At the end of this period, the specimen was transferred directly to a small-scale chamber. The chamber conditions for the 96-h test period are summarized in Table 2. Air samples were collected from the chamber at 24 h, 48 h and 96 h after initiating the test. Samples for the analysis of individual VOCs and TVOC were collected on multisorbent tubes containing Tenax-TA backed by a carbonaceous sorbent. Samples for the analysis of low molecular weight aldehydes were collected on XPOsure Aldehyde Samplers (Waters Corp.). VOC samples were analyzed by thermal desorption GC/MS. TVOC was calculated using toluene as the calibration reference. Individual VOCs (iVOCs) were quantified using multi-point (4 or more points) calibration curves prepared with pure standards, unless otherwise noted. iVOCs without pure standards were quantified based on their total-ion-current responses using toluene as the calibration reference. Formaldehyde and acetaldehyde were analyzed by HPLC and quantified using multi-point (4 or more points) calibration curves.

Availability of Data – All data, including but not limited to raw instrument files, calibration files, and quality control checks used to generate the test results will be made available to the customer upon request.

Table 2. Chamber conditions for test period

Parameter	Symbol	Units	Value
Tested specimen exposed area	A_S	m^2	0.031
Chamber volume	V_C	m^3	0.067
Loading ratio	L	m^2/m^3	0.46
Inlet gas flow rate & Range	Q_C	m^3/h	0.067(0.064-0.070)
Ventilation rate	a_c	h^{-1}	1 ± 0.03
Avg Temperature & Range		$^{\circ}C$	23.4 (22-24)
Avg Relative humidity & Range		%	51 (45-55)
Duration		h	96

* All methods identified in this section are included in Berkeley Analytical Associates’ scope of ISO/IEC17025:2005 accreditation, Testing Laboratory TL-383, International Accreditation Service, www.iasonline.org.

Modeling Parameters for Building Products

Modeling Parameters – The CA DHS Standard Practice describes the modeling parameters for estimating the impact of VOC emissions from a building product on indoor air concentrations in a standard classroom and a standard office space. The Standard Practice prescribes the dimensions and ventilation of the spaces and the exposed surface areas of major materials. The modeling scenario(s) and parameters applicable to this test are listed in Table 3.

Table 3. Parameters used for estimating VOC air concentrations in a standard school classroom for wall

Parameter	Symbol	Units	Value
Product exposed area	A_B	m^2	94.6
Building volume	V_B	m^3	231
Ceiling height	H_B	m	2.59
Outdoor air (OA) flow rate	Q_B	m^3/h	191.1
OA flow rate per area	--	m^3/m^2-h	2.02
Time point of interest	--	hours	96

VOC Emission Test Results

Emitted VOCs – Individual VOCs (iVOCs) detected in the test above lower limits of quantitation are reported in Table 4. iVOCs with CRELs and/or on other lists of toxicants of concern are listed first, followed by unlisted compounds. The 10 most abundant iVOCs are listed if their concentrations were above the lower limits of quantitation. Reporting of fewer than 10 iVOCs indicates that fewer than 10 chemicals met this requirement.

Table 4. iVOCs detected above lower limits of quantitation in 96-h air sample

Chemical	CAS No	Surrogate?*	CREL (µg/m ³)	CARB TAC Category	Prop 65 List?
Vinyl acetate	108-05-4		200	T-IIa	
1-Methyl-2-pyrrolidinone	872-50-4				Yes
2-Ethylhexanoic acid	149-57-5				Yes
1,1'-Oxybis(2-propanol) "Dipropylene glycol, isomer 1"	110-98-5				
2,2'-Oxybis (1-propanol) "Dipropylene glycol, isomer 2"	108-61-2				
2-(2-Hydroxypropoxy)-1-propanol "Dipropylene glycol, isomer 3"	106-62-7				
2,2,4-Trimethyl-1,3-pentanediol monoisobutyrate, (Texanol 1)	25265-77-4-IS1				
2,2,4-Trimethyl-1,3-pentanediol monoisobutyrate, (Texanol 3)	25265-77-4-IS3				
1-Dodecanol	112-53-8				
3-Methyl-1,1'-biphenyl	643-93-6				
Triacetin	102-76-1	Yes			
4-Methyl-1,1'-biphenyl	644-08-6	Yes			

*"Yes" response indicates iVOC quantified using toluene as the calibration reference; all other iVOCs quantified using pure standards

VOC Emission Test Results, Continued

VOC Emission Factors and Estimated Indoor Air Concentrations – The 96-h chamber sample was analyzed for iVOCs including formaldehyde and acetaldehyde. Emission factors for iVOCs were calculated from the chamber parameters, the exposed area of the test specimen and the measured 96-h chamber concentrations (see equations). The emission factors were used to predict the indoor air concentrations of iVOCs for the modeling scenario(s) applicable to this test as shown in Table 3.

Table 5. Measured chamber concentrations at 96 h, calculated emission factors, and estimated indoor air concentrations for individual VOCs in the standard classroom space

Chemical	Chamber Concentration ($\mu\text{g}/\text{m}^3$)	Emission Factor ($\mu\text{g}/\text{m}^2\text{-h}$)	Estimated Indoor Air Concentration ($\mu\text{g}/\text{m}^3$)
Vinyl acetate	38.2	82.3	40.7
1,1'-Oxybis(2-propanol) "Dipropylene glycol, isomer 1"	2.5	5.3	2.6
2,2'-Oxybis (1-propanol) "Dipropylene glycol, isomer 2"	2.4	5.2	2.6
1-Methyl-2-pyrrolidinone	2.9	6.3	3.1
2-(2-Hydroxypropoxy)-1-propanol "Dipropylene glycol, isomer 3"	2.6	5.7	2.8
2-Ethylhexanoic acid	9.2	19.9	9.8
2,2,4-Trimethyl-1,3-pentanediol monoisobutyrate, (Texanol 1)	6.7	14.5	7.2
Triacetin	29.8	64.3	31.8
2,2,4-Trimethyl-1,3-pentanediol monoisobutyrate, (Texanol 3)	6.3	13.5	6.7
1-Dodecanol	7.7	16.5	8.2
3-Methyl-1,1'-biphenyl	3.9	8.5	4.2
4-Methyl-1,1'-biphenyl	6.3	13.6	6.8

VOC Emission Test Results, Continued

Quality Measurements – Chamber samples collected at 24, 48 and 96 hours were analyzed for total VOCs (TVOC). Because the TVOC response per unit mass of a chemical is highly dependent upon the specific mixture of iVOCs, the measurement of TVOC is semi-quantitative. TVOC is used as a quality measure to determine if the VOC emissions from a product are relatively constant or generally declining over the test period. Aldehyde samples collected at 24, 48 and 96 hours were analyzed for formaldehyde as another quality measure.

Table 6. TVOC chamber concentrations at 24, 48, and 96 h with corresponding emission factors and estimated indoor air concentrations in the standard classroom space

Test Duration	Chamber Concentration ($\mu\text{g}/\text{m}^3$)	Emission Factor ($\mu\text{g}/\text{m}^2\text{-h}$)	Estimated Indoor Air Concentration ($\mu\text{g}/\text{m}^3$)
24-h	179	386	191
48-h	212	457	226
96-h	172	370	183

Table 7. Formaldehyde chamber concentrations at 24, 48, and 96 h with corresponding emission factors and estimated indoor air concentrations in the standard classroom space

Test Duration	Chamber Concentration ($\mu\text{g}/\text{m}^3$)	Emission Factor ($\mu\text{g}/\text{m}^2\text{-h}$)	Estimated Indoor Air Concentration ($\mu\text{g}/\text{m}^3$)
24-h	LQ	LQ	LQ
48-h	LQ	LQ	LQ
96-h	LQ	LQ	LQ

Definitions, Equations, and Comments**Table 8.** Definitions of parameters

Parameter/Value	Definition
CAS No.	Chemical Abstract Service identification number
CARB TAC	Toxic Air Contaminant (TAC) on California Air Resources Board list, with toxic category indicated
Prop 65 list	“Yes” indicates the compound is a chemical known to cause cancer or reproductive toxicity according to California Safe Drinking Water Toxic Enforcement Act of 1986 (Proposition 65)
Chamber Conc.	Measured chamber VOC concentration at time point minus any analytical blank or background concentration for empty chamber measured immediately prior to test. Values for duplicate samples are averaged. Lower limit of quantitation (LQ) for listed individual VOCs is 2 µg/m ³ ; lower reporting limit for non-listed VOCs is 5 µg/m ³
Emission Factor	Mass of compound emitted per unit area per hour (calculation shown below). Reporting limits for emission factors are established by LQ or reporting limit for chamber concentration and number of units tested
Classroom/Office Conc.	Estimated indoor air concentrations in standard classroom and/or standard office space calculated using the emission factors from test results and the modeling parameters in Table 3 using the equations given below
Formaldehyde & acetaldehyde	Volatile aldehydes quantified by HPLC following ASTM Method D 5197-97. LQs for formaldehyde and acetaldehyde are 1.2 µg/m ³ and 1.3 µg/m ³ , respectively
Individual VOCs	Quantified by thermal desorption GC/MS following EPA Methods TO-1 and TO-17. Compounds quantified using multi-point calibrations prepared with pure chemicals unless otherwise indicated. VOCs with chronic RELs are listed first, followed by other TAC and Prop. 65 compounds. Additional abundant VOCs at or above reporting limit of 5 µg/m ³ are listed last
TVOC	Total Volatile Organic Compounds eluting over retention time range bounded by n-hexane and n-hexadecane and quantified by GC/MS TIC method using toluene as calibration reference. LQ for TVOC is 20 µg/m ³
LQ	Indicates calculated value is below its lower limit of quantitation
“na”	Not applicable
“<”	Less than value established by LQ

Equations Used in Calculations – An emission factor (EF) in µg/m²-h for a chemical in a chamber test of a building product is calculated using Equation 1:

$$EF = (Q_c (C - C_o)) / A_s \quad (1)$$

where Q_c is the chamber inlet air flow rate (m³/h), C is the VOC chamber concentration (µg/m³), C_o is the corresponding chamber background VOC concentration (µg/m³), and A_s is the tested specimen exposed area (m²).

Definitions, Equations, and Comments, Continued

The standard classroom or office concentration (C_B) in $\mu\text{g}/\text{m}^3$ is estimated using Equation 2 and the parameters defined in Table 3:

$$C_B = (EF \times A_B) / Q_B \quad (2)$$

where A_B is the product exposed area (m^2) and Q_B is the outside air flow rate (m^3/h).

Comments: The emission factor calculations are based on the top exposed surface. The modeling parameters in Table 3 are taken from California Department of Public Health, "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers," CDPH/EHLB/Standard Method V1.1, February 2010. This version of the standard updates CA/DHS/EHLB/R-174.

END OF REPORT

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Appendix A
Photographs of the Tested Product Specimen

Report Information	
Report number	314-002-01AA-Nov2410
Report date	Nov 24, 2010
Product name / Number	Vinyl Tackboard / Tackboard
Laboratory sample tracking No	314-002-01AA



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Appendix B
Analytical Instruments & Operating Parameters

Table A1. Description of analytical instrument components

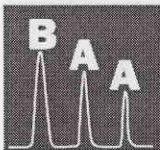
Component	Description
HPLC	Model 1050, UV-VIS detector, Hewlett-Packard
Analytical column	Symmetry™ C18, Waters Corp.
Column dimensions	2.1 mm x 150 mm
Thermal desorber	Unity / Ultra TD, Markes International, Ltd.
Gas chromatograph	Model 6890N, Agilent
Analytical column	DB-1701, J&W Scientific
Column dimensions	1 µm film, 0.25 mm ID, 30 m
Mass spectrometer	Model 5973N MSD, Agilent

Table A2. HPLC operating parameters for analysis of formaldehyde and acetaldehyde

Parameter	Value
Solvent A	65/35% H ₂ O/Acetonitrile
Solvent B	100% Acetonitrile
Flow rate	0.3 mL/min
End time	17 min
Detector wavelength	360 nm

Table A3. Thermal desorption GC/MS parameters used for analysis of iVOCs and TVOC

Parameter	Value
Thermal desorption	
Tube desorb temperature	285 °C
Trap temperature	-6 °C
Trap desorb temperature	300 °C
Trap desorb split ratio	2:1
Gas chromatograph	
Initial temperature	1 °C
Initial temperature time	6.5 min
Temperature ramp rate 1	5 °C /min
Final temperature 1	100 °C
Temperature ramp rate 2	12 °C /min
Final temperature 2	225 °C
Final temperature 2 time	2 min
Mass spectrometer	
Low scan mass, <i>m/z</i>	30 amu
High scan mass, <i>m/z</i>	450 amu
Scan rate	0.5 Hz



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CHAIN OF CUSTODY PRODUCT / MATERIAL VOC EMISSION TEST

August, 2008 Update

(Note: a separate COC must be filled for each product sample)

Client Information*	
Company:	Chattfield-Clarke Co.
Street Address:	14014 Valley Blvd
City/State:	Fontana, CA
Zip/Postal Code:	92335
Country:	USA
Contact (for reporting):	Kim Stowers
Contact Title:	Sec - Treasurer
Phone/Fax Numbers:	909-823-4297 909-823-8224
Email Address:	Kim@Chattfield-Clarke.com

Test Protocol (Check One)*		
CA DHS Section 01350	<input checked="" type="checkbox"/>	10 d conditioning, 24 h, 48 h, 96 h
BIFMA - small chamber	<input type="checkbox"/>	72 h, 168 h
BIFMA - mid-size chamber	<input type="checkbox"/>	72 h, 168 h
01350 Screening (specify test points)	<input type="checkbox"/>	
BIFMA Screening (specify test points)	<input type="checkbox"/>	
CA Office Furniture Bid (chamber/test points)	<input type="checkbox"/>	
Other, specify below:	<input type="checkbox"/>	

Manufacturer Information (if different from client)	
Company:	
City/State/Country:	
Contact Name/Title:	
Phone Number:	

Check Below if Test Data are For Product Certification		
CHPS	<input checked="" type="checkbox"/>	
FloorScore	<input type="checkbox"/>	
CRI Greenlabel	<input type="checkbox"/>	
CRI Greenlabel Plus	<input type="checkbox"/>	
SCS Indoor Advantage, furniture	<input type="checkbox"/>	
SCS Indoor Advantage Gold, furniture	<input type="checkbox"/>	
SCS Indoor Advantage Gold, bldg product	<input type="checkbox"/>	

Sample Details	
Product Name*:	Vinyl Tack Board
Manufacturer Product ID #*:	TackBoard
Sample Internal ID #:	
Date Manufactured*:	10/27/10
Product Category & Use*:	Tack Board - Schools - Offices
Sample Construction Material*:	Vinyl wallcoverings + TIB
Plant Name & Location*:	Fontana, CA
Collection Location within Plant:	
Date & Time Collected*:	10/27/10 9:15 AM
Number of Sample Pieces*:	4
Photo(s) of Collection Location:	Attach
Sample Collected by*:	Keith Monday
Phone/Fax Numbers*:	909-823-4297 909-823-8224
Email Address*:	Kim@Chattfield-Clarke.com

Send Copy of Test Report to Certifier (If Applicable)	
Organization:	
Contact:	

Sample Test Preparation Instructions and/or Comments from Client	

Shipping Details*	
Packed & Shipped By:	Kim Stowers
Shipping Date:	10/27/10
Carrier/Airbill Number:	UPS-1274320103 4709 5594

For BAA Use Only	
Condition of Shipping Package:	ok
Condition of Sample:	ok
Lab Tracking Number:	314-002-01A

Sample Handling				
Relinquished By*	Received By*	Signature*	Date*	Company*
	Tim Cheng		10/29/10	BAA