

## BERKELEY ANALYTICAL ASSOCIATES, LLC

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### PRODUCT VOC EMISSION TEST RESULTS

#### Report Certification

Report Number & Date: 314-001-01A-Oct3007 -- 10/30/2007  
Recalculation Job:  
Original Specimen ID (if recalc job):  
Protocol or test method/criteria: CA DHS Section 01350 protocol  
Certified By: Raja Tannous, Director  
Signature   
Date 10/30/2007

#### Client Information

Client: Chatfield-Clarke Company, Inc.  
City/State/Country: Fontana, CA USA  
Contact name/Title: Ray Monday, President  
Contact Address: 14614 Valley Blvd, Fontana CA 92335  
Phone number: 909-823-4297

#### Manufacturer Information

Manufacturing company: Chatfield-Clarke Company  
Product name: Vinyl Tackboard Panel  
Product sample ID:  
Product category: Tackboards and Visual Aid Boards (10120)  
Product subcategory: Tackboard Panel  
Manufacturer ID:  
Date manufactured: 10/4/2007  
Date collected: 10/8/2007  
Date shipped: 10/9/2007

#### Sample/Specimen Information

Date received: 10/10/2007  
Specimen ID (Lab tracking No.): **314-001-01A**  
Specimen preparation: covered the edges and one side of the cut specimen before testing  
Conditioning period start & duration: 10/12/2007, 10 days  
Test period start & duration: 10/22/2007, 96 hours

**Protocol** -- Emission tests are performed following the revised and updated indoor air quality portion of California's Special Environmental Requirements, "Specifications Section 01350." This document, "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," CA/DHS/EHLB/R-174, 07/15/04, is accessible at [http://www.dhs.ca.gov/ps/deodc/ehlb/iaq/VOCS/Section\\_01350\\_preface.htm](http://www.dhs.ca.gov/ps/deodc/ehlb/iaq/VOCS/Section_01350_preface.htm). Project-Specific results are calculated as described in the Section 01350 document accessible at the Collaborative for High Performance Schools (CHPS) program ([http://www.chps.net/manual/documents/Sec\\_01350.doc](http://www.chps.net/manual/documents/Sec_01350.doc)).

**Table 1. Chamber Conditions for Test Period**

Parameter	Symbol	Units	Value
Product exposed area	$A_C$	$m^2$	0.0316
Chamber volume	$V_C$	$m^3$	0.067
Loading ratio	$L_C$	$m^2 m^{-3}$	0.47
Inlet air flow rate	$Q$	$m^3 h^{-1}$	0.067
Ventilation rate	$a_C$	$h^{-1}$	1.01
Temperature		$^{\circ}C$	23.2
Relative humidity		%	51.2

**Table 2. Parameters used to calculate building VOC concentrations**

Bldg. Component/ Material	<u>Wall - Tackable Panel</u>		
Parameter	Symbol	Units	Building Type*
			<u>Standard Classroom</u>
Product exposed area	$A_B$	$m^2$	94.7
Building volume	$V_B$	$m^3$	231.0
Ceiling height		$m$	2.59
Loading ratio	$L_B$	$m^2 m^{-3}$	0.410
Ventilation rate	$a_B$	$h^{-1}$	0.90
Ventilation vol. fraction	$Vf_B$		0.90
Vent. flow rate per area		$(m^3 h^{-1}) / m^2$	1.98

\* Standard building types are: (1) School classroom defined in Table 7.4, CA/DHS/EHLB/R-174, 07/15/04; (2) Office space (individual) defined in Table 7.5, CA/DHS/EHLB/R-174, 07/15/04; and (3) Large office building with volume ceiling height from East End Project, Products Passed Section 01350, Calif. Integrated Waste Management Board. For floor products ceiling panels, 100% coverage is assumed. For wall paint and wallcoverings, exposed area is wall paint area for the building (<http://www.ciwmb.ca.gov/GreenBuilding/Specs/EastEnd/>).

**Table 3. Pass/fail results of emission test for identified VOCs with chronic RELs**  
 (Only VOCs detected above quantitation limits are reported)

Substance	CAS No.	$\frac{1}{2}$ REL* $\mu\text{g m}^{-3}$	Building Type
			<u>Standard Classroom</u>
Formaldehyde	50-00-0	16.5	Pass
Acetaldehyde	75-07-0	9	Pass
Vinyl acetate	108-05-4	100	Pass

\* The passing level for formaldehyde is  $\frac{1}{2}$  the interim Indoor REL (IREL) of 33 ( $\mu\text{g}$  per cubic meter) developed by Calif. Office of Environmental Health Hazard Assessment (Refer to CA/DHS/EHLB/R-174, 07/15/04). The passing level for acetaldehyde is the full chronic REL of 9.0 ( $\mu\text{g}$  per cubic meter) as specified in: [http://www.dhs.ca.gov/ehlb/IAQ/VOCS/Section\\_01350\\_Addendum\\_2004-01.htm](http://www.dhs.ca.gov/ehlb/IAQ/VOCS/Section_01350_Addendum_2004-01.htm).

**Table 4. List of emitted VOCs\*** (Only VOCs detected above quantitation limits are reported. Individual VOCs with chronic RELs and/or on other lists of toxicants are shown first, followed by unlisted abundant compounds)

Substance	CAS No.	Surrogate?	Chronic REL $\mu\text{g m}^{-3}$	CARB TAC Category	Prop 65 List?
Acetaldehyde	75-07-0		9	T-IIa	Yes
Formaldehyde	50-00-0		3	T-IIa	Yes
Vinyl acetate	108-05-4		200	T-IIa	
1-Methyl-2-pyrrolidinone	872-50-4				Yes
2-Propanone (acetone)	67-64-1				
Pentanal	110-62-3				
Hexanal	66-25-1				
Benzaldehyde	100-52-7				
Nonanal	124-19-6				
2-Ethylhexanoic acid	149-57-5				
Acetic acid	64-19-7	Yes			
1-Pentanol	71-41-0	Yes			
Hexanoic acid	142-62-1	Yes			

**Table 5. Emission Test Results for Individual VOCs\***

Substance	96-h Chamber Concentration $\mu\text{g m}^{-3}$	Emission Factor $\mu\text{g m}^{-2} \text{ h}^{-1}$	Building Concentration $\mu\text{g m}^{-3}$
			<u>Standard Classroom</u>
2-Propanone (acetone)	120.8	257.5	130.3
Formaldehyde	1.8	3.9	2.0
Acetaldehyde	7.9	16.9	8.5
Vinyl acetate	7.6	16.2	8.2
Pentanal	39.1	83.2	42.1
Acetic acid	3.8	8.0	4.1
Hexanal	98.1	209.2	105.9
1-Pentanol	12.3	26.1	13.2
Benzaldehyde	13.1	27.9	14.1
Hexanoic acid	3.4	7.2	3.6
Nonanal	6.9	14.8	7.5
1-Methyl-2-pyrrolidinone	19.8	42.2	21.4
2-Ethylhexanoic acid	82.8	176.4	89.3

\* Parameters and reported values are defined and explained in Table 8

**Table 6. TVOC Chamber & Building Concentrations for Different Test Periods**

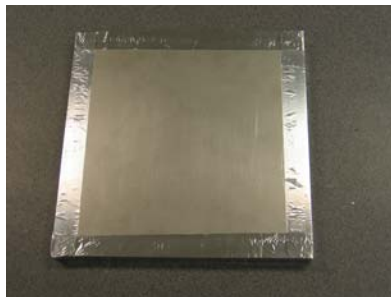
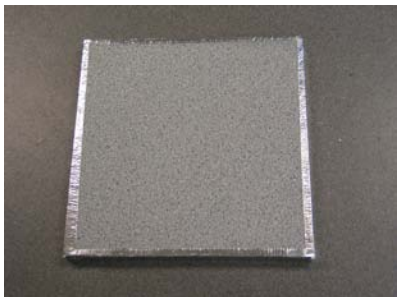
Test Duration	Chamber Conc. $\mu\text{g m}^{-3}$	Emission Factor $\mu\text{g m}^{-2} \text{ h}^{-1}$	Building Conc. $\mu\text{g m}^{-3}$
			<u>Standard Classroom</u>
24-h	287	612	310
48-h	281	599	303
96-h	289	615	311

**Table 7. Formaldehyde Chamber & Building Concentrations for Different Test Periods**

Test Duration	Chamber Conc. $\mu\text{g m}^{-3}$	Emission Factor $\mu\text{g m}^{-2} \text{ h}^{-1}$	Building Conc. $\mu\text{g m}^{-3}$
			<u>Standard Classroom</u>
24-h	1.8	3.9	2.0
48-h	1.7	3.7	1.9
96-h	1.8	3.9	2.0

**Table 8. Pictures of The Tested Specimen**

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**Table 9. Definition of Parameters and Notes to Tables**

Parameter/Value	Definition
CAS No.	Chemical Abstract Service identification number
Surrogate?	“Yes” indicates compound was quantified by GC/MS total-ion-current (TIC) method using toluene as calibration reference
Chronic REL	Chronic Reference Exposure Level (REL) established by Calif. Office of Environmental Health Hazard Assessment, Feb. 2005 and adopted by Section 01350 as target IAQ limit for building; for formaldehyde, IAQ limit is interim Indoor REL of $33 \mu\text{g m}^{-3}$ . No product may contribute more than $\frac{1}{2}$ IAQ limit for an REL compound, with the exception of acetaldehyde for which the full REL is allowed.
CARB TAC Cat.	Toxic Air Contaminant (TAC) on Calif. Air Resources Board list, Dec. 1999, with toxic category indicated
Prop 65 List?	“Yes” indicates compound is chemical known to cause cancer or reproductive toxicity listed by Calif. Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65), Mar. 2005
96-h Chamber Conc.	Measured chamber VOC concentration at 96-h time point minus any analytical blank or blank concentration for empty chamber operated following same procedure. Lower limit of quantitation (LOQ) for individual VOCs on lists of toxicants is $2 \mu\text{g m}^{-3}$ , based on a 2 ng limit for a 1-liter sample. LOQ for TVOC is $20 \mu\text{g m}^{-3}$ . LOQ for formaldehyde and acetaldehyde is given below
Emission Factor	Mass of compound emitted per square meter of exposed surface per hour (calculations shown below). Reporting limits for emission factors are established by LOQ or reporting limit for chamber concentration and specimen’s exposed surface area
Classroom/Office/Office Bldg. Conc.	Concentrations for school classroom, small office (individual), large office building, or specific project building calculated using parameters given in Table 2 (calculations shown below)
TVOC	Total Volatile Organic Compounds quantified by GC/MS TIC method using toluene as calibration reference
Formaldehyde & acetaldehyde	Volatile aldehydes quantified by HPLC following ASTM Method D 5197-97. LOQ for formaldehyde and acetaldehyde is $\sim 1 \mu\text{g m}^{-3}$
Individual VOCs	Quantified by thermal desorption GC/MS following EPA Methods TO-1 and TO-17. Compounds are quantified using multipoint calibrations prepared with pure substances unless otherwise indicated (see Surrogate?). VOCs with chronic RELs are listed first, followed by other TAC and Prop. 65 compounds. Additional abundant VOCs at or above reporting limit of $5 \mu\text{g m}^{-3}$ are listed last. VOCs are listed in order of decreasing volatility within each group
“<”	“Less than” concentrations established by LOQ
“HC”	Hydrocarbon compound
“LQ”	Indicates calculated value is below quantitation based on concentration LOQ
“na”	Not applicable

### **Equations Used in Calculations**

An emission factor (EF) in  $\mu\text{g m}^{-2} \text{h}^{-1}$  for a chemical substance in a chamber test is calculated using Equation 1:

$$EF = (Q (C - C_o)) / A_c \quad (1)$$

where C is the chamber concentration of the substance ( $\mu\text{g m}^{-3}$ ) and  $C_o$  is the corresponding substrate or chamber blank concentration ( $\mu\text{g m}^{-3}$ ). The other parameters are defined in Table 1. For an emitting unit, such as a chair, the number of units, N, is substituted for surface area,  $A_c$ , and EF is expressed as  $\mu\text{g/unit-h}$ .

A building concentration ( $C_B$ ) in  $\mu\text{g m}^{-3}$  can be estimated from the EF using Equation 2:

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

where  $A_B$  is the area of the product in the building space and  $Q_B$  is the outdoor air flow rate to the space.

An EF in  $\mu\text{mol m}^{-2} \text{h}^{-1}$  for an individual VOC in a chamber test is calculated from the above EF using Equation 3:

$$EF (\mu\text{mol m}^{-2} \text{h}^{-1}) = EF (\mu\text{g m}^{-2} \text{h}^{-1}) / MW \quad (3)$$

where MW is the molecular weight (molar mass) of the respective compound.

A chamber concentration in ppb (molar basis) for an individual VOC is calculated from the chamber concentration ( $C - C_o$ ) in  $\mu\text{g m}^{-3}$  using Equation 4:

$$\text{Chamber concentration (ppb)} = (C - C_o) \times 24.45 / MW \quad (4)$$

where 24.45, in L/mol, is the molar volume of air at standard conditions (1 atm pressure, 25° C).

For a furniture component, the workstation concentration of formaldehyde and total aldehydes in ppb can be estimated from the corresponding aldehyde EF ( $\mu\text{mol m}^{-2} \text{h}^{-1}$ ) using Equation 5:

$$\text{WS Aldehyde concentration (ppb)} = (EF_{\text{aldehyde}})(A_{\text{ws}})(24.45) / Q_{\text{ws}} \quad (5)$$

where  $A_{\text{ws}}$  is the surface area of the component in the workstation ( $\text{m}^2$ ) and  $Q_{\text{ws}}$  is the outdoor air flow rate to the workstation ( $\text{m}^3/\text{h}$ ).

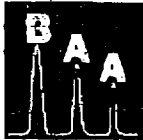
### **Comments**

Cut a 7.5" by 7.5" specimen from the received product sample and taped it to a stainless steel plate to cover all the edges and bottom surface, leaving a 7" by 7" exposed top surface for testing.

END OF REPORT

510) 236-2335

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**CHAIN OF CUSTODY  
 PRODUCT / MATERIAL VOC EMISSION TEST**

2007 Update

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

Client Information*	
Company:	CHATFIELD-CLARKE CO. INC.
Street Address:	14014 Valley Blvd
City/State:	FONTANA, CA
Zip/Postal Code:	92335
Country:	U.S.
Contact (for reporting):	RAY MONDAY
Contact Title:	President
Phone/Fax Numbers:	(909) 823-4297 (909) 823-8224
Email Address:	

Test Protocol (Check One)*		
CA/BHS 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"/>	
Other, specify below:	<input type="checkbox"/>	

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

Test Data Application Program (Check if Applicable)		
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 checked="" type="checkbox"/>	

Sample Details	
Product Name:	VINYL TACKBOARD PANELS
Manufacturer Product ID #:	
Sample Internal ID #:	
Date Manufactured:	10/4/07
Product Category & Use:	CLASSROOM TACKBOARDS
Sample Construction Material:	SPELLBOUND TESTING VINYL/TIB
Plant Name & Location:	
Collection Location within Plant:	
Date & Time Collected:	10/8/07 10AM
Number of Sample Pieces:	4
Photo(s) of Collection Location:	Attach
Sample Collected by:	RAY MONDAY
Phone/Fax Numbers:	(909) 823-4297 (909) 823-8224
Email Address:	RM@CHATFIELD-CLARKE

Copy to Certifier (if Applicable)	
Organization:	
Contact:	

Notes or Comments from Client / Manufacturer	

Shipping Details*	
Packed & Shipped By:	RAY MONDAY
Shipping Date:	10/19/07
Carrier/Airbill Number:	UPS N600 819 8574

For BAA Use Only	
Condition of Shipping Package:	
Condition of Sample:	
Lab Tracking Number:	314-001-01A

Sample Handling				
Relinquished By*	Received By*	Signature*	Date*	Company*
	FARID MASRI	MAIRI	10/10/07	BAA

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CHATFIELD CLARKE

10/11/2007 03:22 FAX 9098238224

Received Time Oct. 12. 2:47PM

