

## BERKELEY ANALYTICAL ASSOCIATES, LLC

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### PRODUCT VOC EMISSION TEST RESULTS

#### Report Certification

Report Number & Date: 279-001-01A-032107 --- 3/21/2007  
Recalculation Job:  
Original Specimen ID (if recalc job):  
Protocol: Chamber test, Section 01350 protocol  
Certified By: Raja Tannous, Director  
Signature signature on file  
Date \_\_\_\_\_

#### Client Information

Client: Timbron International  
City/State/Country: Stockton, CA USA  
Contact name/Title: Zion Dunn, Plant Manager  
Contact Address: 4331 Pock Lane, Stockton CA 95206  
Phone number: 209-983-8393

#### Manufacturer Information

Manufacturing company: Timbron Int'l  
Product name: Timbron Molding  
Product sample ID: Sample 1  
Product category: Flooring (09600)  
Product subcategory: Wall Base  
Manufacturer ID: TIM 623  
Date manufactured: 2/21/2007  
Date collected: 2/21/2007  
Date shipped: 2/21/2007

#### Sample/Specimen Information

Date received: 2/22/2007  
Specimen ID (Lab tracking No.): **279-001-01A**  
Specimen preparation: Applied to Stainless Steel Tray  
Conditioning period start & duration: 2/23/2007, 10 days  
Test period start & duration: 3/5/2007, 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	$A_C$	$m^2$	0.0147
Chamber volume	$V_C$	$m^3$	0.067
Loading ratio	$L_C$	$m^2 m^{-3}$	0.22
Inlet air flow rate	$Q$	$m^3 h^{-1}$	0.068
Ventilation rate	$a_C$	$h^{-1}$	1.01
Temperature		$^{\circ}C$	22.5
Relative humidity		%	51.7

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

Bldg. Component/ Material	<u>Wall Base - Wall Base Material</u>		
Parameter	Symbol	Units	Buidling Type*
			<u>Standard Classroom</u>
Product exposed area	$A_B$	$m^2$	9.7
Building volume	$V_B$	$m^3$	231.1
Ceiling height		$m$	2.59
Loading ratio	$L_B$	$m^2 m^{-3}$	0.042
Ventilation rate	$a_B$	$h^{-1}$	0.90
Ventilation vol. fraction	$Vf_B$		0.90
Vent. flow rate per area		$(m^3 h^{-1}) / m^2$	19.30
			<u>Standard Office Space</u>
Product exposed area	$A_B$	$m^2$	3.2
Building volume	$V_B$	$m^3$	30.6
Ceiling height		$m$	2.74
Loading ratio	$L_B$	$m^2 m^{-3}$	0.105
Ventilation rate	$a_B$	$h^{-1}$	0.90
Ventilation vol. fraction	$Vf_B$		0.90
Vent. flow rate per area		$(m^3 h^{-1}) / m^2$	7.74

\* 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
No VOCs with chronic RELs detected	None	None	<b>PASS</b>

**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?
2-Methylbutane	78-78-4	Yes			
n-Pentane	109-66-0	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-Methylbutane	6.3	29.1	1.5
n-Pentane	5.7	26.2	1.4

  

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 Office Space</u>
2-Methylbutane	6.3	29.1	3.8
n-Pentane	5.7	26.2	3.4

\* 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	LQ	LQ	LQ
48-h	LQ	LQ	LQ
96-h	LQ	LQ	LQ
<u>Standard Office Space</u>			
24-h	LQ	LQ	LQ
48-h	LQ	LQ	LQ
96-h	LQ	LQ	LQ

**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	LQ	LQ	LQ
48-h	LQ	LQ	LQ
96-h	LQ	LQ	LQ
<u>Standard Office Space</u>			
24-h	LQ	LQ	LQ
48-h	LQ	LQ	LQ
96-h	LQ	LQ	LQ

**Table 8. 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 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 ~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 chamber test is calculated using Equation 1:

$$\text{EF} = (Q (C - C_o)) / A_C \quad (1)$$

where C is the VOC chamber concentration ( $\mu\text{g m}^{-3}$ ) and  $C_o$  is the substrate or chamber blank VOC concentration ( $\mu\text{g m}^{-3}$ ). The remaining parameters are defined in Table 1. A building concentration ( $C_B$ ) in  $\mu\text{g m}^{-3}$  is calculated using Equation 2 and parameters defined in Table 2.

$$C_B = (\text{EF} * A_B) / (V_B * v_{f_B} * a_B) \quad (2)$$

### **Comments**

Cut a 7" by 3.25" specimen from the received sample and taped it to a stainless steel plate to cover the bottom surface and all edges, leaving a 7" by 3.25" top surface exposed for testing.

END OF REPORT