

BERKELEY ANALYTICAL ASSOCIATES, LLC

815 Harbour Way South, Suite 6
Richmond, CA 94804
Ph. 510-236-2325; Fax 510-236-2335
E-mail baalab@berkeleyanalytical.com

PRODUCT VOC EMISSION TEST RESULTS

Report Certification

Report Number & Date: 216-002-02A-Aug0408 - 8/4/2008
Recalculation Job:
Original Specimen ID (if recalc job):
Protocol or test method/criteria: CA DHS Section 01350 protocol
Certified By: Raja S. Tannous, Laboratory Director
Signature 
Date August 04, 2008

Client Information

Client: VPI Corporation
City/State/Country: Sheboygan, WI USA
Contact name/Title: A.S. (Bud) Pazur, Technical Manager
Contact Address: 3123 South 9th St, Sheboygan WI 53081
Phone number: 920-451-5860

Manufacturer Information

Manufacturing company: VPI Corporation
Product name: Vinyl Tile
Product sample ID:
Product category: Flooring (09600)
Product subcategory: Resilient Flooring
Manufacturer ID: 0016C12
Date manufactured: 6/30/2008
Date collected: 6/30/2008
Date shipped: 6/30/2008

Sample/Specimen Information

Date received: 7/7/2008
Specimen ID (Lab tracking No.): **216-002-02A**
Specimen preparation: Tested a 17.8 cm by 17.8 cm specimen placed over stainless steel plate. Taped all edges.
Conditioning period start & duration: 7/11/2008, 10 days
Test period start & duration: 7/21/2008, 96 hours

Protocol -- Emission tests are performed following California Dept. of Health Services "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," CA/DHS/EHLRB/R-174, 07/15/04 (http://www.cal-iaq.org/VOC/Section01350_7_15_2004_FINAL_PLUS_ADDENDUM-2004-01.pdf). This practice is based on ASTM D 5116, "Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/Products" and incorporates the chamber testing portion of California Specification 01350 (<http://www.ciwmb.ca.gov/GreenBuilding/Specs/Section01350/>). Project-specific results are calculated as described in Specification 01350.

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	$m^3 h^{-1}$	0.068
Ventilation rate	a_c	h^{-1}	1.01
Temperature		$^{\circ}C$	22.9
Relative humidity		%	50.3

** Specified ranges: 22°C to 24°C, RH 45% to 55%, and Q 0.064 to 0.070 (small chamber) or 5.81 to 6.42 (mid-size chamber)

Table 2. Parameters used to calculate building VOC concentrations

Bldg. Component/ Material	Floor - Floor Covering (any)	Parameter	Symbol	Units	Building Type*
<u>Standard Classroom</u>					
Product exposed area		A_B		m^2	89.2
Building volume		V_B		m^3	231.1
Ceiling height				m	2.59
Loading ratio		L_B		$m^2 m^{-3}$	0.386
Ventilation rate		a_B		h^{-1}	0.90
Ventilation vol. fraction		V_{fB}			0.90
Vent. flow rate per area				$(m^3 h^{-1}) / m^2$	2.10
<u>Standard Office Space</u>					
Product exposed area		A_B		m^2	11.1
Building volume		V_B		m^3	30.6
Ceiling height				m	2.74
Loading ratio		L_B		$m^2 m^{-3}$	0.365
Ventilation rate		a_B		h^{-1}	0.75
Ventilation vol. fraction		V_{fB}			0.90
Vent. flow rate per area				$(m^3 h^{-1}) / m^2$	1.85

* 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 detected	None	None	PASS

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?
No VOCs detected	None	None	None	None	None

* Parameters are defined in Table 9

Table 5. Emission Test Results for Individual VOC
 (Only VOCs detected above quantitation limits are reported)

Substance	96-h Chamber Concentration $\mu\text{g m}^{-3}$	Emission Factor $\mu\text{g m}^{-2} \text{ h}^{-1}$	Building Concentration $\mu\text{g m}^{-3}$
No VOCs detected	LQ	LQ	LQ

* Parameters and reported values are defined and explained in Table 9

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	45	95	45
48-h	69	147	70
96-h	44	94	45
<u>Standard Office Space</u>			
24-h	45	95	51
48-h	69	147	79
96-h	44	94	51

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. Pictures of The Tested Specimen

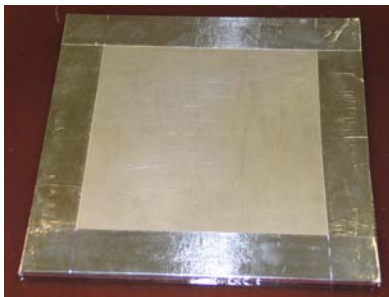


Table 9. Definition of Parameters and Notes to Tables

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

Comments

The emission factor calculations are based on the area of the top surface. Back surface and all edges were sealed during the test.

Note: The test results presented herein are specific to this item. 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.

END OF REPORT



Berkeley Analytical Associates, LLC

815 Harbour Way South, Suite 6
 Richmond, CA 94804-3612
 Phone: 510-236-2325 Fax: 510-236-2335
 e-mail: baalab@berkeleyanalytical.net

CHAIN OF CUSTODY
 PRODUCT / MATERIAL VOC EMISSION TEST
 2007 Update

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

Client Information*	
Company:	VPI CORPORATION
Street Address:	3123 SOUTH 9TH STREET
City/State:	SHEBOYGAN WI
Zip/Postal Code:	53081
Country:	USA
Contact (for reporting):	A.S. (BUD) PAZUR
Contact Title:	TECHNICAL MANAGER
Phone/Fax Numbers:	920 451-5860 FAX: 920 458-1368
Email Address:	ASPAZUR@VPICORP.COM

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

Sample Details	
Product Name*:	VINYL TILE
Manufacturer Product ID #*:	0016C12
Sample Internal ID #:	
Date Manufactured*:	6/30/08
Product Category & Use*:	RESILIENT TILE FLOORING - ESD
Sample Construction Material*:	PVC
Plant Name & Location*:	VPI CORPORATION SHEBOYGAN WI
Collection Location within Plant:	12" SQUARING / BOXING STATION
Date & Time Collected*:	6/30/08 10:00 AM
Number of Sample Pieces*:	4
Photo(s) of Collection Location:	Attach
Sample Collected by*:	A.S. (BUD) PAZUR
Phone/Fax Numbers*:	920 451-5860 FAX 920 458-1368
Email Address*:	A.S.PAZUR@VPICORP.COM

Shipping Details*	
Packed & Shipped By:	T. Alvarado
Shipping Date:	6-30-08
Carrier/Airbill Number:	Fed Ex 021931261070989

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"/>	
Other, specify below:	<input type="checkbox"/>	

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

Copy to Certifier (If Applicable)	
Organization:	SCIENTIFIC CERTIFICATION SYSTEMS
Contact:	RICH MARGOSIAN

Notes or Comments from Client / Manufacturer

For BAA Use Only	
Condition of Shipping Package:	
Condition of Sample:	
Lab Tracking Number:	216-002-02A

Sample Handling				
Relinquished By*	Received By*	Signature*	Date*	Company*
BUD PAZUR	Tim Cheng	Bud Pazur	6/30/08	VPI CORPORATION
		Ty	7/7/08	BAA