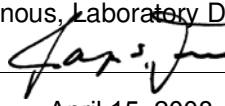


BERKELEY ANALYTICAL ASSOCIATES, LLC

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PRODUCT VOC EMISSION TEST RESULTS

Report Certification

Report Number & Date: 342-001-01A-Apr1608 -- 4/16/2008
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 April 15, 2008

Client Information

Client: Formulators
City/State/Country: Santa Ana, CA USA
Contact name/Title: Benny Dickens, President/Formulator
Contact Address: 1790 S. Boyd St., Santa Ana CA 92705
Phone number: 714-429-9804

Manufacturer Information

Manufacturing company: Formulators
Product name: Hydro-Seal PSA
Product sample ID: 416
Product category: Coatings for Concrete and Masonry (09980)
Product subcategory: Adhesive
Manufacturer ID: 10101
Date manufactured: 2/26/2008
Date collected: 2/26/2008
Date shipped: 2/28/2008

Sample/Specimen Information

Date received: 3/4/2008
Specimen ID (Lab tracking No.): **342-001-01A**
Specimen preparation: Applied one coat of adhesive using 1/16" trowel on 6" by 6" tile.
Conditioning period start & duration: 3/21/2008, 10 days
Test period start & duration: 3/31/2008, 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	0.0232
Chamber volume	V _C	m ³	0.067
Loading ratio	L _C	m ² m ⁻³	0.35
Inlet air flow rate	Q	m ³ h ⁻¹	0.067
Ventilation rate	a _C	h ⁻¹	1.01
Temperature		°C	23.5
Relative humidity		%	47.9

** 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
<u>Standard Classroom</u>			
Formaldehyde	50-00-0	16.5	Pass
<u>Standard Office Space</u>			
Formaldehyde	50-00-0	16.5	Pass

* The passing level for formaldehyde is $\frac{1}{2}$ the interim Indoor REL (IREL) of 33 (μg 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 (μg per cubic meter) as specified in addendum to CA/DHS/EHLRB/R-1A, 07/15/04.

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?
Formaldehyde	50-00-0		3	T-IIa	Yes
1,2-Propanediol (Propylene glycol)	57-55-6				
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, 1 (Texanol 1)	25265-77-4				
2,2,4-Trimethyl-1,3-pentanediol monoisobutyrate, 3 (Texanol 3)	25265-77-4				
2,2'-Oxybis ethanol	111-46-6	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>
Formaldehyde	8.7	25.1	12.0
1,2-Propanediol (Propylene glycol)	315.3	915.7	436.4
2,2'-Oxybis ethanol	13.6	39.4	18.8
1,1'-Oxybis(2-propanol) "Dipropylene glycol, isomer 1"	10.5	30.4	14.5
2,2'-Oxybis (1-propanol) "Dipropylene glycol, isomer 2"	11.1	32.2	15.4
2-(2-Hydroxypropoxy)-1-propanol "Dipropylene glycol, isomer 3"	14.2	41.1	19.6
2,2,4-Trimethyl-1,3-pentanediol monoisobutyrate, 1 (Texanol 1)	285.7	829.5	395.3
2,2,4-Trimethyl-1,3-pentanediol monoisobutyrate, 3 (Texanol 3)	231.1	671.0	319.8
			<u>Standard Office Space</u>
Formaldehyde	8.7	25.1	13.6
1,2-Propanediol (Propylene glycol)	315.3	915.7	494.6
2,2'-Oxybis ethanol	13.6	39.4	21.3
1,1'-Oxybis(2-propanol) "Dipropylene glycol, isomer 1"	10.5	30.4	16.4
2,2'-Oxybis (1-propanol) "Dipropylene glycol, isomer 2"	11.1	32.2	17.4
2-(2-Hydroxypropoxy)-1-propanol "Dipropylene glycol, isomer 3"	14.2	41.1	22.2
2,2,4-Trimethyl-1,3-pentanediol monoisobutyrate, 1 (Texanol 1)	285.7	829.5	448.0
2,2,4-Trimethyl-1,3-pentanediol monoisobutyrate, 3 (Texanol 3)	231.1	671.0	362.5

* 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	526	1528	728
48-h	507	1473	702
96-h	542	1573	750
<u>Standard Office Space</u>			
24-h	526	1528	825
48-h	507	1473	796
96-h	542	1573	850

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	9.9	28.6	13.6
48-h	9.3	27.1	12.9
96-h	8.7	25.1	12.0
<u>Standard Office Space</u>			
24-h	9.9	28.6	15.5
48-h	9.3	27.1	14.7
96-h	8.7	25.1	13.6

Table 8. Pictures of The Tested Specimen

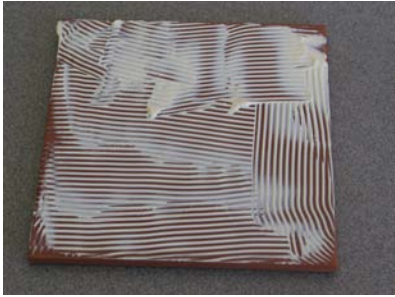


Table 9. Definition of Parameters and Notes to Tables

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:

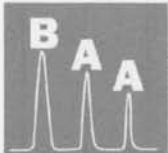
$$\text{WS Aldehyde concentration (ppb)} = (EF_{\text{aldehyde}})(A_{\text{ws}})(24.45) / Q_{\text{ws}} \quad (5)$$

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

7.6 grams of adhesives were applied onto 6" by 6" tile. Coverage was 327.6 grams per m2.

END OF REPORT



Berkeley Analytical Associates, LLC

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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: Formulators
Street Address: 1790 S Boyd
City/State: Santa Ana/CA
Zip/Postal Code: 92705
Country: US
Contact (for reporting): Benny Dickens
Contact Title: President/Formulator
Phone/Fax Numbers: 714-429-9804p 714-429-9804f
Email Address: b.dickens@formulatorsonline.com

Manufacturer Information (if different from client)

Company:
City/State/Country:
Contact Name/Title:
Phone Number:

Sample Details

Product Name*: Hydro-Seal PSA	
Manufacturer Product ID #: 10101	
Sample Internal ID #: 416	
Date Manufactured*: 02/26/08	
Product Category & Use*: Flooring - Adhesive	
Sample Construction Material*: Modified Acrylic	
Plant Name & Location*: Formulators, Santa Ana CA	
Collection Location within Plant:	
Date & Time Collected*: 02/26/08	
Number of Sample Pieces*: 1 x 4oz	Photo(s) of Collection Location: <i>Attach</i>
Sample Collected by*: Jaime	
Phone/Fax Numbers*: Same As Above	
Email Address*: Same As Above	

Shipping Details*

Packed & Shipped By: Jaime
Shipping Date:
Carrier/Airbill Number: <i>UPS K0230837360</i>

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 checked="" 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:
Contact:

Notes or Comments from Client / Manufacturer

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For BAA Use Only

Condition of Shipping Package:
Condition of Sample:
Lab Tracking Number: <i>342-001-01A</i>

Sample Handling

Relinquished By*	Received By*	Signature*	Date*	Company*
Benny Dickens	<i>FARID MASRI</i>	<i>[Signature]</i>	<i>2/26/08</i>	Formulators
		<i>[Signature]</i>	<i>3/4/08</i>	BAA