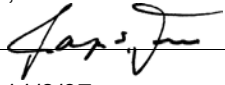


## BERKELEY ANALYTICAL ASSOCIATES, LLC

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: 262-002-01A-Nov0807 - 11/8/2007  
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 11/8/07

#### Client Information

Client: Bradford Industries  
City/State/Country: Lowell, MA USA  
Contact name/Title: Bob Pliskin, V.P.  
Contact Address: 1857 Middlesex St, Lowell MA 01851  
Phone number: 978-459-4100

#### Manufacturer Information

Manufacturing company: Bradford Industries  
Product name: Pyrotarp Acrylic Paint  
Product sample ID: PT113ACR HE LW  
Product category: Paints and Coatings (09900)  
Product subcategory: Acrylic Paint  
Manufacturer ID: Pyrotarp PT113ACR HE  
Date manufactured: 7/17/2007  
Date collected: 10/12/2007  
Date shipped: 10/12/2007

#### Sample/Specimen Information

Date received: 10/15/2007  
Specimen ID (Lab tracking No.): **262-002-01A**  
Specimen preparation: no specimen preparation was done; tested the product sample as received  
Conditioning period start & duration: 10/19/2007, 10 days  
Test period start & duration: 10/29/2007, 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](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	$A_c$	$m^2$	0.0329
Chamber volume	$V_c$	$m^3$	0.067
Loading ratio	$L_c$	$m^2 m^{-3}$	0.49
Inlet air flow rate	$Q$	$m^3 h^{-1}$	0.067
Ventilation rate	$a_c$	$h^{-1}$	1.01
Temperature		$^{\circ}C$	22.9
Relative humidity		%	50.4

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

Bldg. Component/ Material	<u>Wall - Wall Covering (any)</u>		
Parameter	Symbol	Units	Buidling Type*
			<u>Standard Classroom</u>
Product exposed area	$A_B$	$m^2$	94.7
Building volume	$V_B$	$m^3$	231.1
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	$V_{fB}$		0.90
Vent. flow rate per area		$(m^3 h^{-1}) / m^2$	1.98
			<u>Standard Office Space</u>
Product exposed area	$A_B$	$m^2$	34.8
Building volume	$V_B$	$m^3$	30.6
Ceiling height		$m$	2.74
Loading ratio	$L_B$	$m^2 m^{-3}$	1.139
Ventilation rate	$a_B$	$h^{-1}$	0.75
Ventilation vol. fraction	$V_{fB}$		0.90
Vent. flow rate per area		$(m^3 h^{-1}) / m^2$	0.59

\* 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?
1,2-Propanediol (Propylene glycol)	57-55-6				

**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>
1,2-Propanediol (Propylene glycol)	34.8	71.2	36.0
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>
1,2-Propanediol (Propylene glycol)	34.8	71.2	120.1

\* 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	22	45	23
48-h	40	81	41
96-h	LQ	LQ	LQ
<u>Standard Office Space</u>			
24-h	22	45	76
48-h	40	81	137
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. 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:

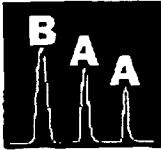
$$\text{WS Aldehyde concentration (ppb)} = (EF_{\text{aldehyde}})(A_{\text{ws}})(24.45) / Q_{\text{ws}} \quad (5)$$

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

The client provided a product sample consisting of an 8" by 10" stainless steel plate with a 6" by 8.5" coated area on one side. Tested the product sample as received, with both sides exposed. The given emission factors are based on the coated area.

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: BRADFORD INDUSTRIES, INC.  
 Street Address: 75 ROGERS ST.  
 City/State: LOWELL, MA  
 Zip/Postal Code: 01852  
 Country: USA  
 Contact (for reporting): BOB PLISKIN  
 Contact Title: VICE PRESIDENT SALES/ MARKETING  
 Phone/Fax Numbers: 978 459 4100 / 978 459 2597  
 Email Address: bobpliskin@901.com

**Manufacturer Information (if different from client)**

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

**Sample Details**

Product Name\*: PYROTAR ACRYLIC PAINT  
 Manufacturer Product ID #: PYROTAR PT113 ACR HE  
 Sample Internal ID #: PT113 ACR HELW  
 Date Manufactured\*: 7/17/07 (mo:60306)  
 Product Category & Use\*: PAINTS + COATINGS (09900)  
 Sample Construction Material\*: WATER BASED ACRYLIC PAINT  
 Plant Name & Location\*: BRADFORD IND. INC. 75 ROGERS ST. LOWELL MA 01812  
 Collection Location within Plant: R&D - ENGINEERING  
 Date & Time Collected\*: 10/12/07 8:00 AM  
 Number of Sample Pieces\*: 3 Photo(s) of Collection Location: Attach  
 Sample Collected by\*: STEVE SATIN - DEVELOPMENT ENGINEER  
 Phone/Fax Numbers\*: (978) 459-4100 978 459-4798  
 Email Address\*: SSatin@bradfordind.com

**Shipping Details\***

Packed & Shipped By: STEVE SATIN  
 Shipping Date: 10/12/07  
 Carrier/Airbill Number: FED EX 8630 8580 4551

**Sample Handling**

Relinquished By*	Received By*	Signature*	Date*	Company*
<u>STEVE SATIN</u>	<u>AL HODGSON</u>	<u>Steve Satin</u>	<u>11/8/07</u>	<u>BRADFORD INDUSTRIES, INC.</u>

**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 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**

\_\_\_\_\_

**For BAA Use Only**

Condition of Shipping Package: \_\_\_\_\_  
 Condition of Sample: \_\_\_\_\_  
 Lab Tracking Number: 262-002-01A